THE RAILWAY REVIEW

No. 45 NOVEMBER 7, 1896. XXXV.

A FAR-REACHING DECISION.—A very important and far-reaching decision was recently rendered by Chief Justice Springer, at South McAlester, I. T., in the case of Green McCurtain et al. vs. John M. Grady et. al. The case involves the title and ownership to a large coal mine, located near South McAlester, operated and claimed by the Choctaw, Oklahoma & Gulf Railroad Co. The amount in litigation will approximate $500,000, and the principle involved in the case will affect property in the territory valued at millions. The main point in controversy was the proper construction to be placed upon that provision of the constitution of the Choctaw nation which provides that any citizen of the Choctaw nation who discovers any mine of coal shall have the exclusive right and privilege to work the same so long as he may choose, one mile in any direction from his works or improvements, provided he does not interfere with the rights of a former settler. The Choctaw Railroad Co., which was successful in the court below, contended that this section gave to the discoverer the right to mine all veins within a radius of one mile from the works in every direction. Appellants contended that the discoverer took only the particular vein upon which he made his discovery. Chief Justice Springer held that the contention of the Choctaw Railway Company was sound and that the discoverer took all veins of coal within a mile radius from his works in every direction, and showed conclusively that this was not only the accepted construction of the Choctaw nation itself, but the only one which could be adopted without producing endless litigation and confusion.

AN EARLY INSTANCE OF INTERCHANGEABILITY.—Many years ago an engine, built by Corliss, was set up in a rolling mill in one of the western American cities. It was, in several respects, an exceptional engine, different in a number of particulars from the regular Corliss design, and has only once or twice been duplicated. After running for four or five years, it was taken down and erected in another city, and the engineer in charge found that one of the dashpots needed renewing. An order was at once sent to Mr. Corliss for the dashpot castings in order to fit up a new set. In due time there arrived by express a box, and the engineer, on opening it, found. much to his indignation, instead of the castings, a dashpot, bored out, bolt holes drilled, seat faced off, and everything finished, ready for putting on to the engine. His first impulse was to consign the thing to the scrap heap and order another casting for, as he remarked, "any fool should have known better than to send a finished pot 1,500 miles with the expectation of its fitting an old engine." However, the thought occurred that there might possibly be metal enough in the flanges to enable new holes to be bored, and he, therefore, concluded to try the thing in its place, and was much astonished to find that it went on just where it belonged, with bore and bolt holes coming exactly in line. That was at a time when interchangeability of parts in machinery was not so common as it is now and when its existence in connection with small details might well have been a matter of wondering comment.—]Cassier's Magazine.

A NEW PROCESS FOR THE MANUFACTURE OF STEEL.—A demonstration, extending over several days, was recently made in England of a new process for the manufacture of steel. The chief feature of the process is the employment of a mixture of dephosphorising agents which effectually rids the metal of phosphorus and sulphur in a remarkably short space of time, the actual conversion not occupying more than three minutes. The chief elements of this mixture are nitrate of soda and magnetic iron sand, which are used, with common salt and black oxide of manganese, to form a base to the converting vessel before the molten pig iron is run in from the cupola. When the molton iron is brought into contact with the mixture a violent reaction takes place, the two become mechanically and automatically mixed, the slag is skimmed off, and the converted metal is run into a Siemens open hearth furnace, where it is refined for an hour and a half to two hours. It is then tapped into a ladle in the usual way. The process is essentially basic—that is to say, it eliminates the metalloids which are so destructive to the steel so completely that it allows the use of inferior grades of iron, and thereby enables the common ores of Cleveland, Northamptonshire, and other districts to be utilized. The fact is of importance, in so far as it opens up a better prospect for our home iron mining industry, which has of late years been somewhat overshadowed by the ores imported from Spain and other countries. The inventor of the process is Mr. B. P. Stockman, M. Inst.C.E

THE SIBERIAN RAILWAY,—The great Siberian Railway is now completed to Krasnoyarsk. During the season of 1895 918¼ miles were built. This gives a direct route from Petersburg to the Yenesei river, a distance of 3,056½ miles. The proposed length of the great Siberian Railway from Cluliabinsk to Vladivostok on the Japan sea is 4,547 miles, of which one-third is now completed. A large amount of work has also been done on the branches. There are now engaged upon the actual work of construction over 70,000 workmen, beside engineers and officers. Up to 1896 $32,488,000 had been expended. The plan of building across the mountains and canons on the south of Lake Baikal, which was the most difficult feature of the whole enterprise, has been abandoned and trains will be ferried across the lake by transfer steamers, a distance of about 20 miles.

THE NEW HEILMANN LOCOMOTIVE.—The Heilmann locomotive, which was tried in 1893 on the Western Railway of France, has now been constructed or is now re-constructing, of a size to develop 1,350 horse power. Improvements suggested are better suspension of the motors, a new type of steam engine, and modified driver's apparatus. The boiler is to be of ordinary locomotive type. The heating surface will be 180 square meters (1,937.5 square feet), and the grate surface 3.3 square meters, or about 35 feet—a pretty large area for a European locomotive. The engine is to be a Williams & Robinson, with six cranks. The Heilmann scheme simply brings electrical working into contempt, for it cannot prove an economy. It carries an immense boiler and a six-crank steam engine, and its one advantage is that in going uphill the steam engine can be run at speed, and will not therefore lose power, as is now the case with a locomotive, which as it travels slower, also revolves slower, and loses power thereby. But this is to some extent a fable. When a locomotive mounts a hill it revolves more slowly, and therefore, gets more pressure, and for an occasional hill it is not usually necessary to take along the whole roundhouse. However, our readers may judge for themselves. The two generators, of a pressure of 450 volts, are excited by a dynamo, driven by its own 28 horse-power engine, the motors are fixed to the frame of the bogies, and have an elastic connection with the axles. The power is 1,000 horse power at the rail. The draw-bar pull is a little under half the cylinder output. The tire pull is about 75 per cent of the cylinder indication, so that: of 1,000 horse power, 250 is lost in the transmission and 250 in the engine considered as a carriage, and the new engines are to be capable of hauling 350 tons at a speed of 100 kilometers about 80 miles). It is thought that at present the advantage as to coal consumption rests with the ordinary locomotive. The first Heilmann engine weighed 115 to 120 tons, and developed only 450 horse power, but the new machines are to develop 1,000 at the rail, and apparently only weigh 120 tons, or at the rate of 100 kilograms per horse power, as compared with the weight of torpedo boat machinery only 16 kilograms per horse power, a comparison of little moment, however, considering the difference of conditions. It is expected that these new moving stations will be ready for trial at an early date. We do not doubt that the locomotive will run; that it will do so at a high speed; that it will haul good loads; that it will be a hill climber. We may admit all this, and more; and we think we shall be still be free to paraphrase a famous French saying and repeat, "It is magnificent, but it is not engineering.—[Revue International de l'Electrite.

THE USE OF FLINT MUSKETS.—Strange as it may appear flint muskets are not a relic of a bygone age. Last year no fewer than 1,820,000 gun flints were produced at the Lingheath Mines, Brandon, Suffolk, England. These flints are chiefly applied to arms which are destined to delight African and other savages, who, having so long been used to flint-locks, are reluctant to give them up. The method of manufacture of these gun-flints is very interesting. In the operation of "flaking', the worker will take a "quarter" in his left hand, and, placing it on his knee, round which a protecting band of leather has been strapped, gently tap the flint with a hammer, giving it each time a well-directed blow. At every tap a flake 6 in. long and 1 in. wide falls into his hand, and if a good one, is deposited in a pail by his side, all bad ones being discarded. The "knappers" work these flakes with hammers with long thin heads, often made of old files, transversely breaking the strips of flint on an iron ridge fixed in their benches. After this they carefully flake them till they get a complete gun flint. A flaker can make 7,000 or 8,000 flakes in a day of twelve hours, and a knapper will finish 3,000 gun flints in the same time. There are four sizes of flints in use: the musket, the carbine, the horse and the single.

AN IRON TREE.—A remarkable discovery is narrated by Prof. Carter to the Academy of Science of Philadelphia, as being made lately near Three Tans, Montgomery county, Pa. In a sandstone quarry at that place an iron tree has been found imbedded in the rock 10 feet below the surface. The tree is about 18 feet long and 18 18 inches in diameter, and has been completely turned to iron, or rather to the iron ore known as brown hematite; and Prof. Carter accounts for the phenomena by the fact that the shales and the sandstones in that neighborhood are covered with red oxide of iron, and sometimes with brown hematite. It is presumed that the iron ore was reduced by organic matter, and that it was made soluble in water containing carbonic acid gas; then, as the water holding the iron in solution came in contact with the tree, the iron was precipitated on the latter, and there was an interchange of vegetable and mineral matter, so that the rocks were relieved of their coloring and the tree took it up.

AN ENGLISH NATIONAL RAILWAY MUSEUM.—In a letter to the Times, Mr. Clement E. Stretton states that for many years past it has been known to those interested in English railway history that there is no national railway museum to which old relics, drawings, and books can be presented. He says: "More than ten years ago I suggested the formation of such a museum in London. I then wrote to several of the companies, and also made an offer to present the whole of my collection to such an institution, and that offer still remains open. At the present time American engineers are in this country hunting for and purchasing important old drawings for the Field Museum, Chicago, and the French agents are obtaining similar information, no doubt for their coming exhibition in the year 1900. The result is that important links in the chain of railway history are being taken away from this country for ever, instead of being placed in a national railway museum, which certainly ought to exist in London."

ACETYLENE.—M. N. Grehant's experiments at the General Physiological Laboratory of the Paris Natural History Museum have shown that one volume of acetylene consumes during combustion two and a half volumes of oxygen, and yields two volumes of carbonic acid, thus favoring the belief that the combustion of this gas is complete, no combustible mixture containing carbon being generated. In order, however, to ascertain whether the products of combustion contain a trace of combustible gas, he tested them in a continuous grisoumeter, with platinum spiral kept incandescent by galvanic accumulators, and only obtained, during two hours, from 79 cubic inches in a baryta tube, a ring, scarcely visible, of baryta carbonate, showing so slight a trace of carbonic acid that it could not be determined. In another experiment, an india-rubber bag filled with acetylene gas, subjected to a pressure of 1½ in. of water, supplied a Manchester burner placed underneath a metal cone, connected by a refrigerator with two metal valves, and a muzzled dog breathed the products of combustion for half an hour. In the grisoumeter, 2½ in. of normal arterial blood showed a reduction equal to 3.7 divisions, while the same quantity taken at the end of the experiment showed a reduction of 3.8 divisions. M. Grehant concludes that the products of combustion given off by acetylene, when a Manchester burner is used, are free from the slightest trace of combustible gas containing carbon.

Track Awards on the Pennsylvania Railroad.

As a result of the general manager's inspection of the Pennsylvania lines west of Pittsburgh the prize of $100 for the best piece of track was awarded to Mr. Samuel Talkington supervisor of subdivision No. 1, Louisville division, extending from Louisville to Marshfield Ind. This division also received two prizes of $50 each, awarded to section foremen for the best section on the division. The general manager's second prize was awarded to the Richmond division. Mr. V. S. Deebler won the $100 prize for the best section on the Pennsylvania Railroad. This section is at Dillerville, on the main line.

Master Mechanics' Association Circular.

The committee on "Ratios of Grate Area, Heating Area and Cylinder Volume of Locomotives", in preparing for its report at the next convention of the Master Mechanics' Association has issued a circular of inquiry which is presented in unusually good form and is exceedingly comprehensive. The questions have been arranged in a column, requesting information pertaining to freight and passenger locomotives, giving the chief data which has a bearing upon the subject at hand. It is stated in the circular that information is desired in connection with the dimensions given with, with reference to the working of the engines whether the steaming qualities are good or only indifferent Information is also requested from which insufficient steam producing capacity of over cylindering may be selected, and lest respondents should object to publishing this information with reference to their own road, it is the intention of the committee to omit from the report all references to the ownership of the locomotives. Sketches of grate bars and arrangements of grates are asked for together with average results of steaming power of the locomotives in question when using the coal mentioned in the statement. This subject may be considered one of the most difficult of all of those which are to come up at the next convention and it is obvious that the value of the report will depend upon the individual efforts of the members in giving the committee the benefit of their experience. The committee consists of Messrs. G. R. Henderson, A. S. Vogt, R. Wells, S. M. Vauclain and C. J. Mellin. With this strong combination the question should give up some of its mysteries.

Central Railway Club.

The next regular meeting of the Central Railway Club will be held on Friday, Nov. 13, 1896, at the Hotel Iroquois, Buffalo, at 2 p. m., and will be preceded at 10 a. m. by a meeting of the executive committee for the consideration of important business.

The following reports will be presented.

"What is the Best Plan to bring about the Adoption of M. C. B. Standards by Railroads?" Committee, A. M. Waitt, G. W. West, R. S. Miller, James Macbeth, Wm. McWood, John S. Lentz.

"Apprentice Boys in Railroad Shops?" Committee, John Mackenzie, M. L. Flynn, E. D. Nelson, W. G. Tabor, N. Lavery.

"Shall the Cubic Capacity of Ordinary Box Cars be Increased; and if so, what shall be the Maximum Limit?" Paper by H. H. Perkins.

The topics for discussion are:

Report of committee on "Car Roofs".

Report of committee on "Comparative first cost and cost of maintenance of planished iron locomotive boiler jackets, and the plain sheet iron or steel, painted".

Topical questions submitted by members.

THE TEN BRINCK FIRE-BOX.

The application of the Ten Brinck system of fire-box has been made, since 1860, to 1,215 engines of the Paris-Orleans Railway, i. e., to almost all the engines of this company. In the first instance, this system was adopted in order to substitute coal for the large quantities of coke then used, without at the same time making smoke in the stations, even with the smoky fuel which the Orleans Company had to use owing to its geographical situation. The excellent results obtained in smoke consuming and economy of fuel caused this system to be applied successively to most of the engines in use, which included all the engines built since 1862. The Ten Brinck fire-box has also the advantage of giving a large direct heating surface which was sought in the Sturrock divided fires and those of Mac Connell and Beathe. Besides consuming the smoke and increasing the heating surface, the Ten Brinck furnace produces a good distribution of heat over the surface of the fire-box and realizes the very important advantage of a rational combustion as completely as is possible.

The Ten Brinck furnace as used by the Orleans Company is composed essentially, as is shown in Fig. 1, 2, 3, of:

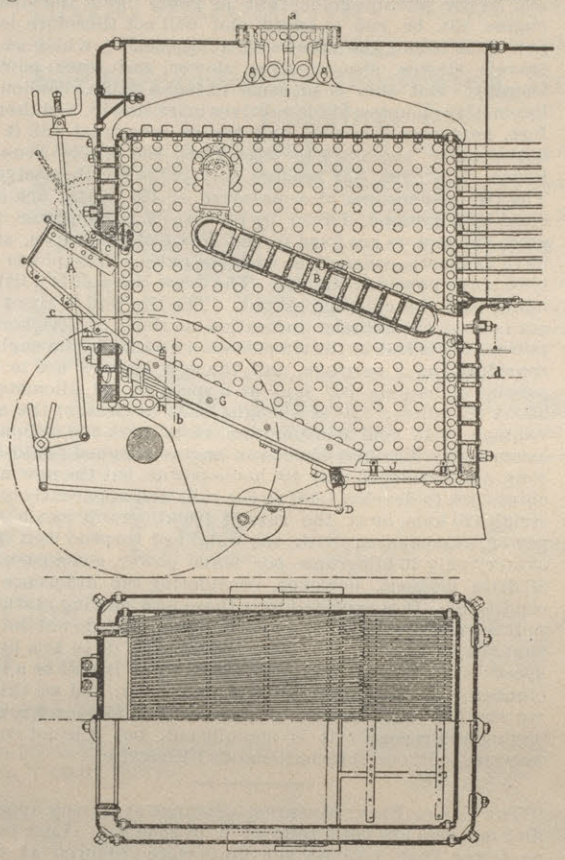
Two grates, of which the principal one G, inclined at an angle of 25 deg., is fixed, and the other J, smaller, and placed in front of the former one, is horizontal and movable round an axle for dropping the ashes. A hopper A, in cast and wrought iron, almost as wide as the fire-box, for charging the fuel, of which the bottom, ordinarily inclined at 40 deg., is fixed as a prolongation of the fixed grate. A large air valve C, is placed over the top plate of the hopper and worked by a lever to regulate the quantity of air admitted into the fire-box, in order to burn the gas coming from the distillation of the coal in the upper part of the fixed grate. A flat table B, made of copper placed in the middle of the fire-box and about parallel to the grate and connected to the sides and front of the fire-box by four tubes which allow for circulation of the water and steam and allow free expansion.

The coal is fed in by the hopper, it slides on the fixed grate as fast as it is made into coke, and the clinker made can accumulate on the dropping grate J and be easily removed. The air is introduced by the air valve above the fuel and mixes with the gas driven back by the table, so that it burns the gas coming from the coal which comes down the hopper with a slight excess of air. A closed ash pan D, fitted in front with a door, can be adjusted at will from the foot plate to regulate the draft. Two stoking doors are placed to the right and left above the hopper to allow the fire to be seen and poked and to allow the top of the table to be cleaned, and finally when necessary to allow a tube to be plugged. A blower allows live steam to be blown into the chimney to increase the draft.

The Ten Brinck furnaces are really gas producers, for the gas coming from the distillation of the coal on the top of the fixed grate is burnt on the return of the flame by the influx of air directed into it by the valve over the hopper, to mix it with the gas coming from the combustion of the coal on the lower part of the fixed grate. To get the most complete smoke consumption possible with this sort of furnace, it is necessary while running, to keep the two grates completely covered by fuel and the air valve more or less open according to the intensity of the consumption, so as to burn, with a slight excess of air, the gas distilled from the coal. In stations, or when the throttle is closed while running it is necessary to open the blower and reduce suitably the opening of the air valve. In all cases, when coal is put on, the blower must be slightly opened, or the door of the ashpan slightly lowered, and the hopper must be completely filled, after pushing forward towards the front of the grate the lighted coal which has not slipped down of itself owing to the inclination of 25 deg. of the grate and the vibration of running.

If one admits that on an ordinary boiler grate of a stationary engine one cannot conveniently burn without forced draft more than 142 to 156 lbs. of coal per square foot per hour with long wide flues which permit the free development of the flame, it is clear that burning on the locomotive fire grates in ordinary fire-boxes, 71-95 lbs. per square foot per hour the gas even with forced draft cannot be completely burnt before arriving at the tubes. On the other hand, if the grate is only charged with a thin bed, and little at a time, the air passing through the fuel flows parallel with the gas, without mixing intimately with it, and further the admission of air every time the door is opened for putting on coal causes chills which interfere with the evaporation and damage the tube plate. If on the other hand the charges are increased so as to be made less frequently, the amount of gas which escapes unburnt is increased and the evaporation thus diminished.

It is to avoid these drawbacks that brick arches are generally used, especially in England, to drive the gas towards the door which is fitted with a special plate deflector intended to throw air into the current of gas so as to break it up and mix with it which facilitates combustion. In Ten Brinck furnaces the mixture of gases and the combustion are better obtained than in furnaces with deflectors and brick arches, because the air is introduced by the wide air valve across the whole width of the fire-box, and also because owing to the slope of the hopper and fixed grate the combustion takes place gradually by progressive distillation till it burns without smoke.



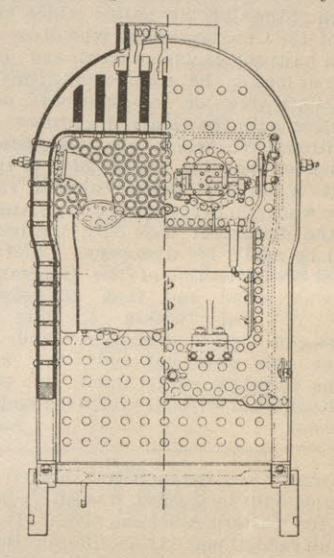
THE TEN BRINCK FIRE-BOX.

The Ten Brinck furnace can also be charged to an excessive extent because the amount of air introduced can be increased at will to ensure good combustion.

For goods engines, the production of smoke in the stations being less inconvenient than for passenger engines, the Orleans Company has adopted an arrangement of Ten Brinck furnace like that proposed by Mr. Bonnet, engineer to the Eastern of France Railway. Mr. Bonnet's simplification was made at first in order to apply the Ten Brinck system to existing locomotives without being obliged to remove at great trouble a large part of the back face of the fire-box. This simplification though it does not insure smoke consumption, having given in practice sufficiently satisfactory results for goods engines and some mixed engines, has been since used in the construction of new engines destined for one of these services. The Orleans Company actually possesses 636 locomotives fitted with Ten Brinck, and 579 locomotives fitted with Ten Brinck Bonnet furnaces. In the arrangement of Ten Brinck Bonnet furnace used by the Orleans Company the hopper is replaced by a large oval door; the air valve is replaced by an air damper with vertical openings fixed on the middle of the door; the door is fitted inside with a deflector intended to direct the air forward and to each side. Also, to increase the supply of air at the sides of the fire, two riveted tubes are fitted, one on each side, low down which admit a constant supply of air into the fire. In the Bonnet fire-box the fixed grate is inclined at 25 deg. as in the Ten Brinck, and as a consequence of the top being much below the fire hole, the bed of fuel lies in contact with the back part of the fire-box and the direct heating surface is thereby increased. With the Bonnet door the charging of the grate on each side at the back is more difficult than with the Ten Brinck hopper, and care must be taken in practice to cover this part well, towards which the coal is also pushed by the slide. The back of the grate is arranged on the slope towards the back corners.

In the different sorts of Ten Brinck and T. B. Bonnet fire-boxes of the Orleans Company: The fixed grate is made of iron bars with a section like the blade of a knife 5.1 inches high, .47 inch thick on the top and .24 inch thick on the bottom. The spacing of the bars is done by rivet heads on alternate bars. The grate is arranged in fan shape, i, e, the spacing on the bars is about 0.24 inch at the back and about 0.47 inch in front, in order to give the air a passage proportional to the intensity of the combustion. The bars of the moving grate are also of knife section iron, 2.2 inches deep, 0.4 inch thick on top and 0.2 inch thick underneath, with an average spacing of .55 inch.

The spacing of the fixed and movable grates have been determined practically to suit the fuel used. All the bars of rolled knife shaped iron, separated in place only by the conical or round heads of rivets of small diameter are well cooled by the air and last a long time and are very cheap. The bottom plate of the hopper is formed of two cast iron plates bolted together. These pieces can be easily replaced and



are mounted so as to expand freely. The sides and top of the hopper are of sheets. The top is made in two pieces in order to allow the piece next the fire to be replaced easily as it wears out most quickly, owing to the action of the fire. They are fixed with bolts in oval holes to allow for expansion and prevent buckling.

The air valve is of cast iron and provided at the edge on the fire side with a flange intended to protect the upper edge of the opening into the fire-box against the great heat developed in this neighborhood by the mixture of air and gas. A T iron is also fixed on this edge for the same purpose. The table is made entirely of copper with forged caps, and the stays are the same as those of the fire-box, screwed, riveted and drilled all along with a 0.24 inch hole. Its life is about the same as the fire-box and varies from 10 to 15 years. To close the interstices between the table and the sides of the fire-box, a grout of fire clay and broken fire bricks is used, and for the front in passenger engines, fire bricks molded into special shapes for this purpose. Originally the tubes of the table were made by forging and hammering and their manufacture was difficult and costly. For ten years they have been cast in the shops of the company in Paris, using according to the process proposed by Mr. de Fontenay, engineering chemist to the company, phosphor copper, an alloy which flows easily in green sand, owing to the small quantity of phosphorus which it contains.

When wrought tubes were used, the price of the rough pieces was say, 27 cents per pound. To-day the tubes in phosphor copper cost rough about 1.65 franc net the kilogram, say 4 cents per pound as a maximum.

The inclination of the tables in the fire-boxes and their dimensions not being the same in all types of engines, it would be necessary for molding these tubes by ordinary methods to have a considerable number of patterns. The company has avoided this difficulty by doing the molding of the pieces in question by means of special apparatus.

To facilitate the cleansing of the table and its tubes, to prevent the damage which might result from calcareous deposits on the inside of the walls, the table is provided with an manhole in the middle of its upper face and a plug in the lowest part and manholes are placed outside the boiler opposite each of the four tubes. The engines with large fire-boxes have three tubes instead of two in the bottom of the table in order to let it be well washed out to avoid incrustation which would produce a rapid deterioration of the parts not in constant contact with the water.

The application of the table to locomotives is, in conclusion, a real advance. If the arrangement did not succeed in the railways which first made trial of

*Published in the Bulletin of the International Railway Congress in the form of an appendix to the discussion of a paper on locomotive fire-boxes by Mr. Hodeige, chief engineer Belgian State Railways.

it, it is because it had not received all the necessary perfecting. It is also indispensable in order to profit by the Ten Brinck furnace to train the men well who are to use it. It is owing to this care and the good order in which the apparatus is kept that with the Orleans Company the perfected apparatus has succeeded to such a point that while first applied to passenger engines to avoid smoke in the station, it is now adopted for most of the goods engines whose consumption of fuel has fallen considerably since its adoption. It has also brought such an improvement in the facility in making steam, that the drivers do not like the engines with ordinary fires. It used to be wrongly supposed that the tables would rapidly deteriorate. If a few single cases were found during the first year it was mostly due to the careless accumulation of incrustation which is very easily avoided. The passages in the fire-boxes suffer in the same way when they are badly cleaned. But with the arrangement of manholes which make all parts of the table accessible, one can make a thorough cleaning of the interior and incrustation does not accumulate, especially if a good disincrustant fluid is used.

DEFECTIVE LUBRICATION OF LOCOMOTIVE VALVES.

In connection with the discussion before the Western Railway Club at its October meeting, on the subject of the paper by Prof. Goss upon the performance of the locomotive "Schenectady," Mr. E. M. Herr, assistant superintendent of motive power of the Chicago & Northwestern Railway presented two interesting indicator cards which illustrate the importance of providing efficient lubrication for the

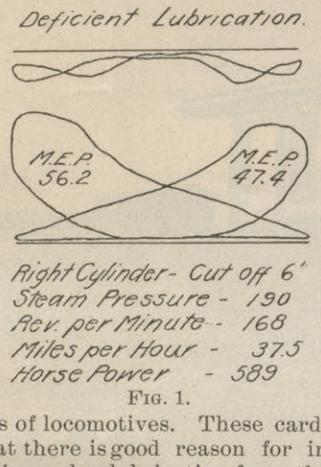


FIG. 1.

slide valves of locomotives. These cards bring out the fact that there is good reason for investigating and improving valve lubrication from the standpoint of economical working of the locomotive, entirely aside from the benefit to be derived by preventing the cutting of the valves and seats through a lack of lubrication. This is an example of the possibilities of a locomotive testing plant in the line of producing results of immediate practical importance as well as giving results of highly scientific investigation. This lubrication problem is one which comforts mechanical men every day and it is doubtful whether

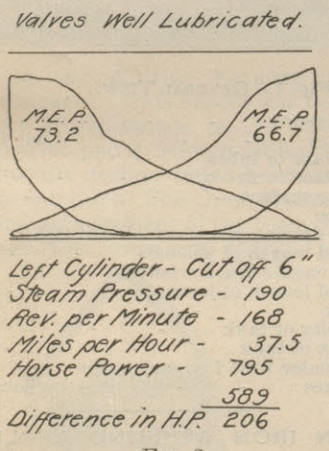


FIG. 2.

they have appreciated the importance of the matter. Mr. Herr's remarks in connection with the cards are as follows:

"These two cards were taken simultaneously, one from the left hand cylinder and the other from the right hand cylinder of the same engine, one showing 795 horse power, the other one showing 589 horse power, a difference of 206 horse power in the two cylinders. Without changing anything about the engine except the lubrication, the horse power on the right cylinder was made to show the same as the other. In other words the difference was caused by lack of lubrication of the valves which made the parts of the motion spring or give and prevented the valve from opening the ports properly and admitting enough steam. The lubrication was not bad enough to cut the valve in the time it was run. It was not run very long, but this is not an extraordinary case at all. I will say that this is a similar engine to the one from which the cards were taken that were presented with my discussion of Prof. Goss' paper. The valve motion on this engine is remarkably stiff; there are no bends in the eccentric rods. On our freight englnes with long eccentric rods, I have frequently seen indicator cards where the mean effective pressure was reduced one-half, through the spring of the valve motion caused by an insufficiently lubricated valve. This in my opinion may be the reason why one engine may sometimes not pull as well as a smaller engine; the larger engine, if the valves move hard, not getting enough steam into the cylinders to give horse power sufficient to move itself and the train."

THE APPRENTICE BOY.*

J. N. BARR.

The apprentice system on railroads at the present day consists, as a rule, in placing a boy in the shop at a given rate of pay, advancing his rate about twenty-five cents at the end of each year, and at the end of four years his apprenticeship is ended. He then ranks as a full fledged mechanic. If he is attentive to his work and the foreman takes enough interest in the boy's welfare to properly select work, he will come out of his apprenticeship a fairly good operator with the chisel and file; also on the lathe, planer and possibly some other miscellaneous tools. He will also be somewhat posted on laying out work; the use of templates and the minor workshop methods. The system does not contemplate that he shall be able to read and write, and in this respect has made but little advance over that in vogue at the time when the art of reading and writing was confined to the monasteries of the middle ages. Every one who is in a position requiring the employment of apprentices is familiar with the remark, "I can't get him to go to school and so would like to get him work in the shop as an apprentice."

It is not intended by the above to intimate that the average applicant for position of apprentice cannot read nor write, but certainly it is seldom indeed that there are any rules or regulations requiring anything in the way of education in applicants for positions.

The requirements and training during the four years course of apprenticeship in railway machine shops turns out a man who is able to take hold of the average job in a machine shop and perform it satisfactorily. Since the time, however, that the apprentice system was inaugurated there have been great advances in the knowledge of mechanical subjects. The literature bearing on mechanical questions has become almost as voluminous as that on any other subject, engaging the attention of learned men, and if an apprentice to a mechanical trade expects to progress it becomes almost a necessity that he should have some literary and scientific training in addition to the mechanical knowledge which he can gain in the shop.

The technical schools of to-day are turning out young men who are, to a certain extent, fitted for mechanical pursuits. The shop education, however, of such is extremely limited, and there is a great deal of reluctance after the young man has spent the time and money necessary to graduate at one of these mechanical schools to take up shop work with the accompanying poor pay; and the ordinary apprentice, if attentive and thoughtful, stands at the end of his four years of shop experience much more competent than the average technical school graduate to take charge of shop work.

If, now, a course of technical instruction, not too elevated in its aims, were added to the shop work of the ordinanary apprentice, it would certainly lead to the result of obtaining better men for the future. With this idea in view, it seems to me that one of the first steps would be to require a certain amount of knowledge to be acquired in schools as a condition of admission to the shop as an apprentice. Our common school systems in all cities or towns which are large enough to secure the location of terminal railway shops, is of a very high grade. Any graduate of such school might be considered as having sufficient education to enter a shop as an apprentice, and if a rule were made that applicants for positions as apprentices in railway shops must have such a certificate, it would produce a decided advance in the mental qualifications of our apprentices.

The next important subject would be no provide a systematic course of instruction to be carried through the four years of the apprentice's life, of such a character as to leave him at the end of the time in possession of a mass of technical education which would put him in somewhat the same position with reference to technical knowledge of to-day as his shop experience puts him with reference to mechanical knowledge. It is a difficult matter to specify just how much instruction should be carried out and what kind of instruction should be given in the various branches necessary. A knowledge of the common school studies being pre-supposed, the additional knowledge required would be as follows:

Mathematics really forms the foundation of his subsequent knowledge in mechanical matters, for without it the mechanic will be practically unable to attack any problem which may arise. At the same time there is so much in mathematics which cannot be applied practically, but which is needed as a matter of training, and which quite necessary as such, that it is difficult to select what is necessary.

A knowledge of geometry sufficient to enable the student to fully understand the basis of the rules of mensuration should be required.

In algebra a general knowledge of the fundamental operations, of fractions, and of equations of first and second degree, should be required. There are possibly a few other subjects in algebra which might be taken up to advantage, but the above are necessities; as is also a knowledge of plain elementary trigonometry. The above, with a little training in descriptive geometry covering orthographic projections and the simpler forms of intersections, will give the student the mathematical knowledge necessary to attack almost any problem which he may meet in his practice.

The apprentice should also have a certain amount of knowledge on the subjects of chemistry and physics. Any ordinary elementary chemistry of the present day will give him the information which is absolutely necessary for him. And to this should be added a course of instruction in the chemistry of metals, oils, and the items which he has daily to use. This part of the program could be made extremely interesting as the student has so many cases before him which can be used as illustrations. The chemistry of iron, steel and brass can all be presented to him as living facts. The chemistry of case-harding and other operations of this kind are equally interesting and valuable.

The subject of physics is, perhaps the most important of the apprentice's studies and instruction in this, in the writer's opinion, should be carried rather further than that of any other branch. The illustrations on this subject which are constantly presenting themselves to the notice of the apprentice in a railway machine shop are innumerable, and if properly utilized cannot fail to give to a young man so employed, as good an idea of physics in general as can be obtained with the aid of the costly apparatus at most of our institutions of learning.

Education in drawing and in the elements of descriptive geometry can be obtained in the drawing room, and the apprentice should have a portion of his time allotted to drafting office work.

General machine shop practice should also be a regular branch of study. There are many books of an elementary character which are now published on this subject and any of them would make a satisfactory text book, the study of which would enable the apprentice to make much more decided advancement in the machine shop than would be otherwise possible.

The studies of the first year should possibly be confined to machine shop practice or mechanical manipulations, geometry and algebra.

The second year should complete mathematics, continue the study of mechanical manipulation, and physics, and during this year the apprentice should have an opportunity of spending about two months in the drafting office.

The third and fourth years should be devoted chiefly to the study of physics, mechanical manipulation and machine design, with at least three months of each year in the drafting office.

If the above system were carefully followed out, the results would be in the first place—that many who are admitted now to the advantages of obtaining mechanical experience, would be excluded on account of improper preparation.

Second—Of those who do obtain admission, a number would drop out on the way, on account of a lack of mental ability, and there would be this addional advantage gained—that the young men would not have time to decorate the street corners as is now, unfortunately, too much the case.

At the end of his term of apprenticeship the young man would find he not only was a fair mechanic so far as manipulation of tools is concerned, but that he would have a general knowledge mechanics and mechanical manipulations which, with the ordinary run of mechanical work, could not be obtained short of ten years practical mechanical experience He would also have such a knowledge of mechanics and physics as would enable him to attack with every hope of success, almost any problem which might arise. He would find at the end of his term that, in additlon to being taught to work with his hands, he had been taught to think, and he had acquired the qualifications during his apprenticeship with which his future experience would enable him to fill a commanding position in mechanical work.

It is a difficult matter at present to say just how this work of education should be carried on. In most cities where large shops are located, the boys have the advantage of night schools, and if the matter was taken up by those in charge of shops, and those in charge of night schools, I have no doubt that such arrangements could be made as would enable the boys to secure the most of the necessary iustructions outlined above. In most large shops of the present day, also, young men may be found, either in the shops or drafting office, who have a technical training and who could conduct classes of apprentices quite successfully. In the matter of workshop manipulations whatever the text book may be, the knowledge of the shop foreman would be of great benefit when such studies are taken up. Most railroad companies could, without expense, furnish a room which might be used as headquarters of the young men pursuing their studies.

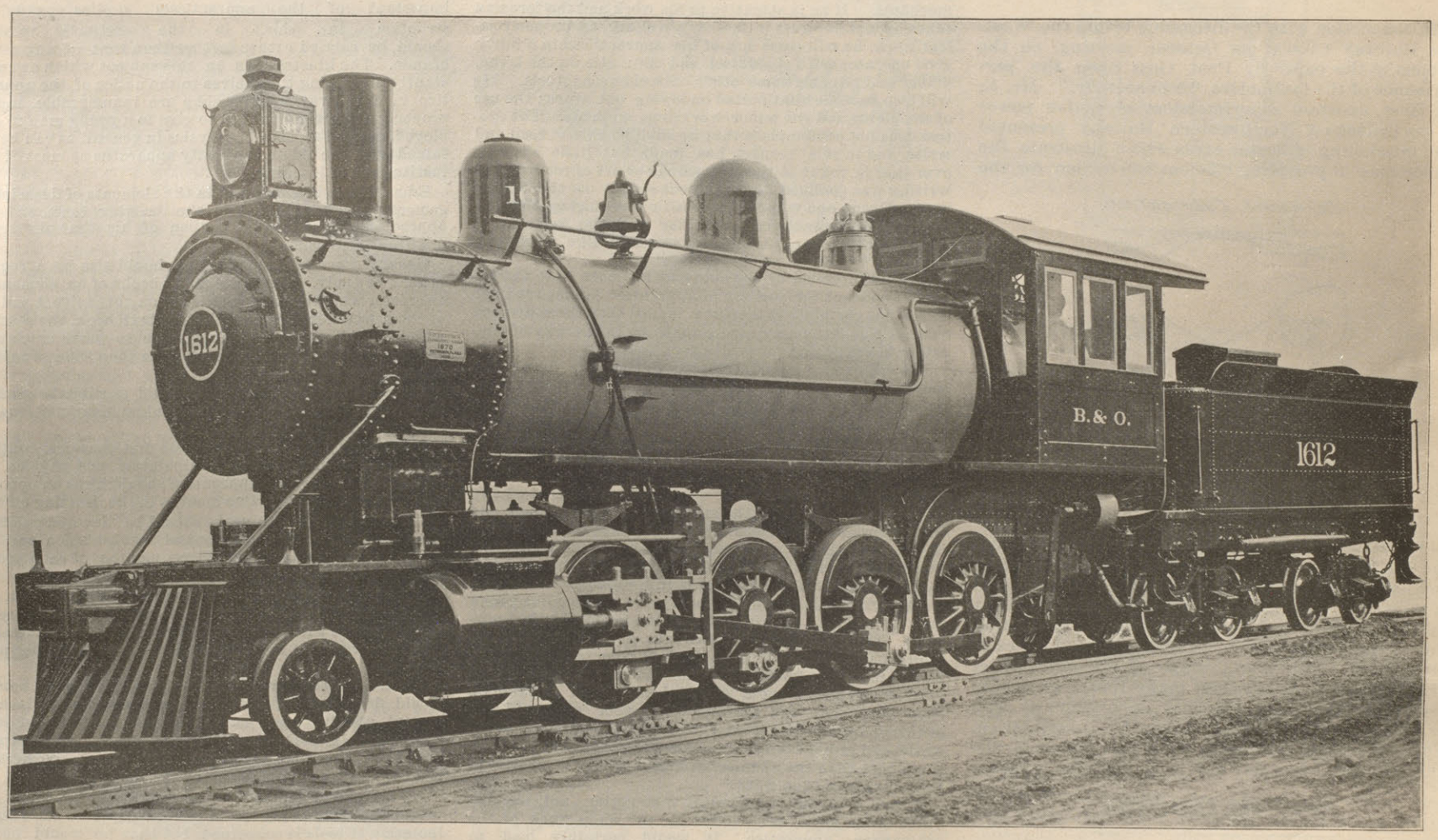
It was the intention of the writer to formulate a four years' work of study somewhat similar to that of the technical schools but restricted in its scope. He found this undertaking more difficult than he had at first conceived and is inclined to think that this work should be a joint

*A paper read before the Western Railway Club, September, 1896.

work between some of our practical members and some of our members who are thoroughly posted, through their connection with technical schools, with the present technical requirements.

ANOTHER HEAVY CONSOLIDATION LOCOMOTIVE—BALTIMORE & OHIO R. R.

Descriptions of four new locomotives recently built for the Baltimore & Ohio R. R. from designs by Mr. Harvey Middleton, general superintendent of motive power of that road, were presented in the RAILWAY REVIEW of October 17, of the current volume, and through the courtesy of Mr. Middleton, another heavy locomotive of the consolidation type, built by Pittsburgh Locomotive Works, is illustrated by the accompanying engraving Fig. 1. This locomotive was also built from specifications by Mr. Middleton, the design being especially adapted for freight service on the mountain divisions of the road. The construction is heavy and the engines are powerful. The cylinders are 22 x 28 in., and the driving wheels are 54 in. in diameter. The boiler is large, of the extended wagon top type with the crown sheet supported upon crown bars. The heating surface is 2313.2 sq. ft. and the grate area 32.7 sq. ft.



BALTIMORE & OHIO CONSOLIDATION LOCOMOTIVE—PITTSBURGH LOCOMOTIVE WORKS.—FIG. 1.—GENERAL VIEW.

The boiler has numerous washout plugs for cleaning the crown sheet and flues. A departure has been made in the spacing of the tubes, the space between the tubes being $\frac{3}{4}$ in. instead of $\frac{5}{8}$ in., which is the usual practice. In putting this boiler together the sheets were securely bolted together, and all the rivet holes reamed and the outer edges of the holes slightly chamfered. The thickness of the sheets in the fire-box is somewhat heavier than usual, being $\frac{7}{16}$ in. for the crown, $\frac{5}{8}$ in. for the side and door and $\frac{1}{2}$ for the tube sheet. The fire-boxes are united to the frames in a secure manner. They are secured by means of heavy clamps instead of the usual form of suspended link.

On account of the trouble which has been experienced with locomotives having large cylinders by the breakage of cylinder castings which is due to the cylinders and saddles forming the principal connection between the boiler and the frames, a strong method of bracing and reinforcing at this point is employed in this design. A heavy casting, shown in Fig. 2 has been placed ahead of the cylinders, filling the space between the frames. This acts to keep the frames square in the same manner as does the foot plate of the American type of locomotives at the back ends of the frames. This plate also takes much of the racking strains and relieves the cylinders and saddles of this duty. The form of the casting is clearly shown in the sketch. The cylinders are provided with heavy vertical ribs, located at the four corners of the saddle and extending from the flange under the smoke-box to the lower flange at the bottom of the bed and filleting into the side of the top tongue of the frame. It is believed that these heavy ribs will act as braces to withstand the shock, thereby saving the cylinders. The lower end of the guide yoke, to which the guides are attached, is bolted to the upper portion to facilitate repairs. The ample brackets for securing the guides to the guide yoke are also worthy of observation. These are provided with heavy lips which fit over the sides of the guides for holding them squarely to the guide yoke. Ample bearing surfaces are provided for the crosshead guides.

The side rods have solid forged oil cups. The driver brakes are of the latest design of the American type using push cylinders, which construction does away with the packing around the piston rods. The Leach sander is used on these engines. The front bumper drawhead is made unusually long, for the protection of the pilot in coupling up. The cab is well lighted and is provided with ample ventilation by means of a hinged door in the roof and the hinging of the sash in the rear of the cab, thereby inducing a current and carrying off the hot air. These locomotives are provided with two steam gages, one in the forward part of the cab and the other on the rear head of the boiler. The tanks are made of heavy sheets, the top, inside and bottom being $\frac{5}{16}$ in., and the outside plates $\frac{1}{4}$ in. They are provided with a long transverse filling hole, thereby increasing the range for stopping at the standpipes. They are equipped also with steps of the form recommended by the Master Mechanics' Association by the committee on the subject last year, and with hand holds on all four corners of the tank. The forward and back draft castings of the tender are united by long through rods instead of depending upon the frame for the pulling stresses.

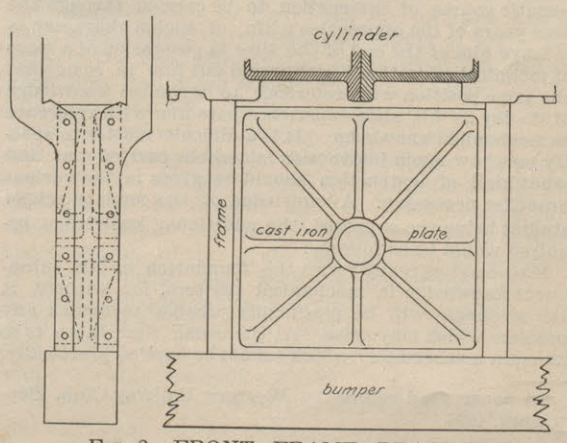


FIG. 2.—FRONT FRAME BRACING.

A combination vacuum and automatic steam chest relief valve has been placed upon the steam chests of these engines. The spring in this valve is set a few pounds above the boiler pressure so that in case the engine is reversed in going down hill the cylinders will be relieved of the accumulating pressure. The chief dimensions are given in the following table:

Fuel	Bituminous coal
Gage of track	4 ft. 8½ in
Total weight of engine in working order	168,000 lbs
Total weight of engine on drivers	155,000 lbs
Driving wheel base of engine	15 ft. 4 in
Total wheel base of engine	23 ft. 8 in
Total wheel base of engine and tender	52 ft. 6 in
Hight from rail to top of stack	14 ft. 7¾ in
Cylinders, diameter and stroke	22x28 in
Piston rods	Steel, 4 in. diam
Type of boiler	Extended wagon top
Diam. of boiler at smallest ring	64 in
Diam. of boiler at back head	73⅛ in
Crown sheet supported by crown bars.	
Stay-bolts 1 in diam., spaced 4 in. from center to center	
Number of tubes	246
Diameter of tubes	2¼ in
Length of tubes over tube sheet	14 ft. 9½ in
Length of fire-box inside	115 in
Width of fire-box inside	41 in
Brick arch	supported on studs
Working pressure	180 lbs
Kind of grates	Cast iron, rocking
Heating surface in tubes	2132 sq ft
Heating surface in firc-box	181.2 sq ft
Total heating surface	2313.2 sq ft
Grate surface	32.7 sq ft
Diameter of driving wheels outside of tires	54 in
Diameter and length of journals	8½x10 in
Diameter of engine truck wheels	30 in
Diameter and length of journals	5x8¾ in
Type of tank	Level top
Water capacity of tank	4000 gals
Fuel capacity of tank	280 cu ft
Weight of tender with fuel and water	83,300 lbs
Type of brakes	Westinghouse American

MODERN IRON WORKING APPLIANCES.

I.

FOUNDRY EQUIPMENT—CUPOLAS AND LADLES.

It is the purpose of this journal to publish a series of articles under the caption of "Modern Iron Working Appliances," which shall consist of descriptions and illustrations of shop tools and other parts of equipment such as are now being used in the most modern practice in various branches of manufacture, paying particular attention to those which are designed for railway repair shops and locomotive and car building establishments. It is not the intention in these articles to cover all the many different designs of tools in use. That would require a number of large volumes. It is the intention, however, to give clear and concise descriptions of machinery,

appliances and methods which are in use, and to give such as are worthy of investigation by those who may be contemplating equipping new shops or making additions to old ones. Many of the machines which will be illustrated will be from designs which have been in use for a number of years, and owing to their having been described at previous dates will be

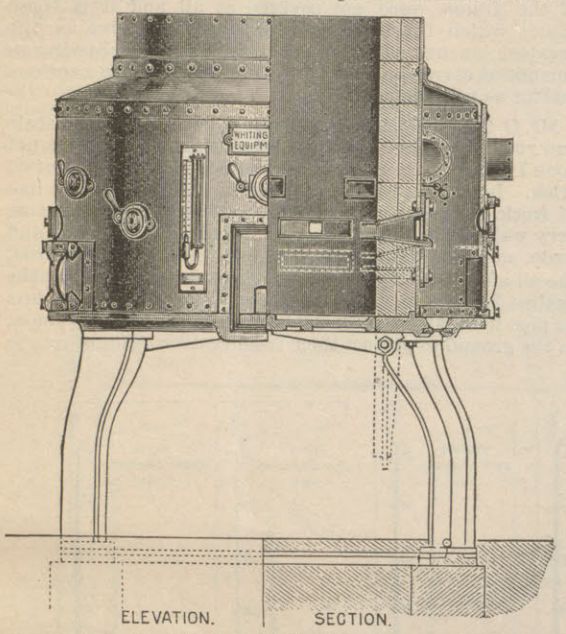


FIG. 1.—THE WHITING CUPOLA.

familiar to many of our readers. This is unavoidable, however, and every effort will be made to obtain only the latest and best designs for illustration.

In the foundry the cupola is one of the all important appliances, and in the illustration, Fig. 1, will be found the Whiting cupola one of the most improved forms, built by the Whiting Foundry Equipment Company of Chicago. This cupola was the outcome of many years of experience in the designing of foundry equipment, and it has several features which are peculiar to this design, which have made it popular among foundrymen. The chief of these features is the form and arrangement of the tuyeres. These are in two rows, the lower one forming an annular air inlet which distributes the air around the entire circumference of the lining. Each tuyere is flaring in shape and while the opening through which the air is admitted is small in area, it is expanded into a large horizontal opening, the area of which at the point of delivery is nearly double that at the point of admission. The result is that the blast instead of being concentrated on one point and heating that up to a high temperature is diffused evenly over a large area and gives uniform temperature throughout the furnace. The tuyeres are arranged on slides and they can be adjusted vertically, as shown by the dotted lines. This is for varying the capacity of the cupola, or making a change in fuel from coke to coal or vice versa. The tuyeres in the upper row are similar to the lower ones and are used only when melting large heats for supplying sufficient air for consuming carbon gases which might otherwise escape. When melting small heats any one or all of this row of tuyeres is closed up by means of dampers provided for that purpose. A safety tuyere is applied to each cupola for notifying the operator in case the iron is too high in the cupola. Each cupola is also provided with a blast gage, air tight peep-holes located opposite each tuyere and fitted with mica, removable side plates for cleaning out the air chamber and lining supports for facilitating repairs.

It is stated that in a cupola of average size the proportion of iron to coke including the bed is about 10 to 1 and that in a No. 7 cupola, rated at 10 to 12 tons per hour, with a shell 72 inches in diameter, a record of six months work showed a total of 13,416 tons melted at an average proportion of 10.31 to 1. This work was done without relining the cupola which speaks well for its lasting qualities. This cupola is adapted for use in any class of foundry work from the heaviest to the lightest, and numbers of them are in use in many parts of the United States, a large number of them being in use in large steel works.

Another well known and popular cupola is manufactured by Byram & Co., and is known as the Colliau cupola. The illustration Fig. 2 shows the essential features of this cupola and from this it will be seen that it presents a good and mechanical appearance and has all the attachments necessary for good working. The tuyeres in this cupola are in two sets of six each and are arranged so that they will distribute the blast evenly over the entire area of the combustion chamber. The blast is admitted through two flanged openings one on each side which keeps down the friction and produces an even pressure on all the tuyeres. These cupolas are both exceedingly simple in construction and the builders can show records which prove that iron can be melted in them to a very high temperature in a short time and with a small amount of fuel. The Whiting is made in 16 sizes ranging in capacity from ½ to 25 tons per hour and in diameter of shell from 27 to 102 in., while the Colliau is made in capacities ranging ½ to 20 tons per hour, having shells from 28 to 91 in.

The forms and sizes of foundry ladles are legion and the illustrations Fig. 3 and 4 show two of the most common types. Fig. 3 shows a geared truck ladle manufactured by the Whiting Foundry Equipment Co. in many sizes, the capacity of which is gaged to suit the requirements of a foundry of any size. This is a very convenient form of ladle for use in foundries where the number and range of cranes is limited and where heavy weights are moved on tramways. As practically all foundries are now equipped with traveling cranes the ladle shown in Fig. 4 is an example of a type which is quite generally used. This is a geared crane ladle made by Byram & Co. in sizes having a capacity of from 1,000 to 32,000 lbs. A worm gear is used for tipping the ladle and all its parts are made heavy and strong. Fig. 5 shows a car wheel ladle manufactured by the Whiting Foundry Equipment Co., for this special class of work. This ladle is made of suitable capacity for pouring one wheel and is fitted with a pointed detachable bail with heavy cast iron trunions, a detachable tipping shank, a safety catch and it is made of extra heavy iron in order to withstand the constant usage incident to this work. The ladle shown in Fig. 6 is one of the most common types in use for general work. This is tipped by a spur gear which is easily managed and gives the operator absolute control of his work. The hand wheel is carried out to one side without the use of bevel gearing, and the gear is protected by a steel cover, and detachable shanks are used. This ladle is also manufactured by the Whiting Foundry Equipment Co.

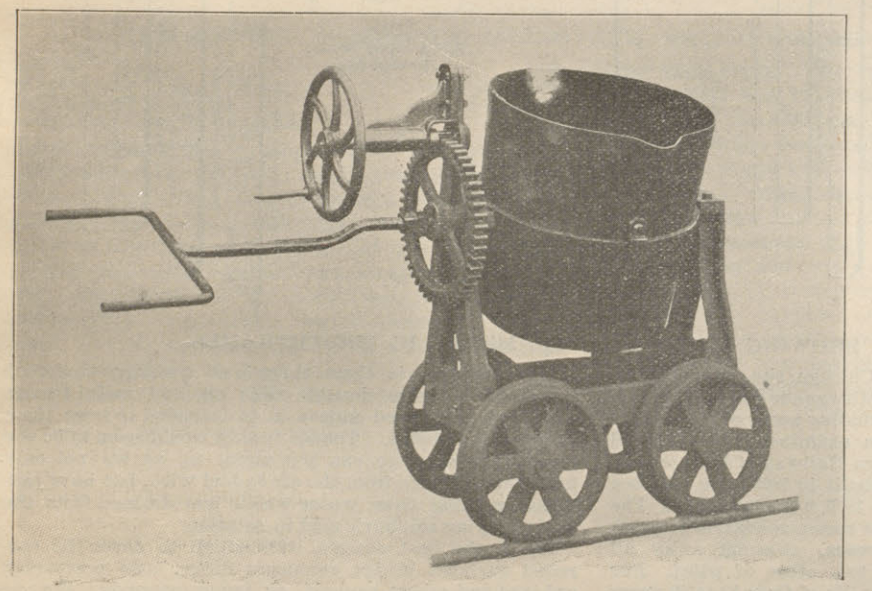


FIG. 3.—GEARED TRUCK LADLE.

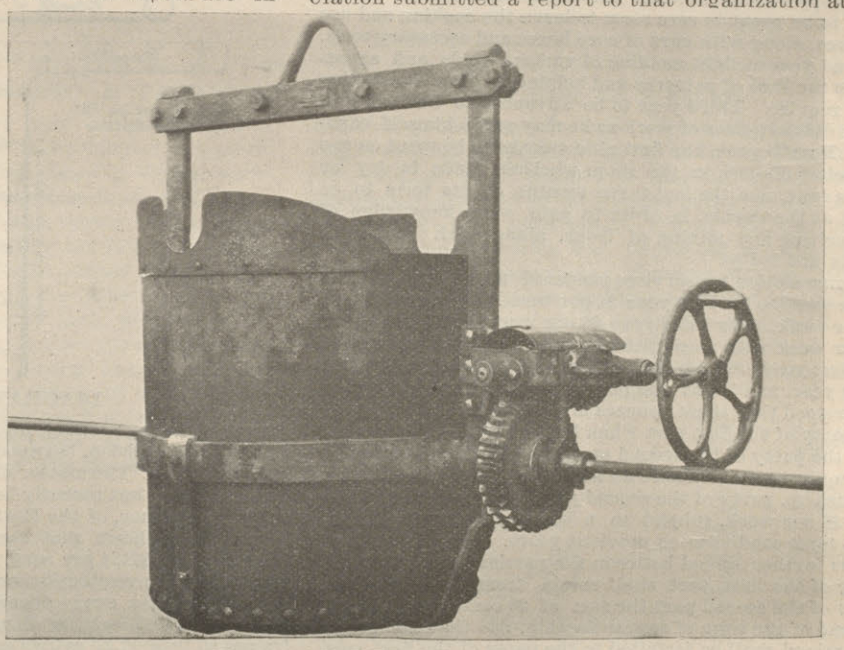


FIG. 4.—GEARED CRANE LADLE.

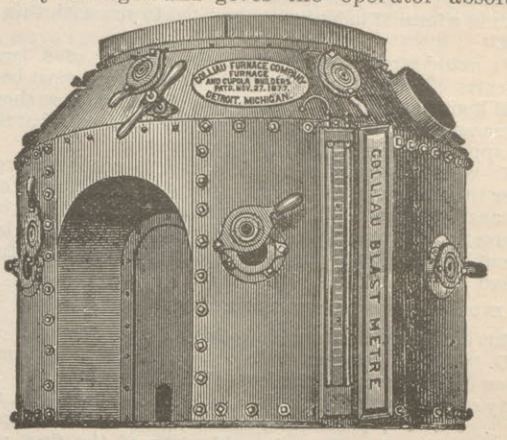


FIG. 2.—COLLIAU CUPOLA.

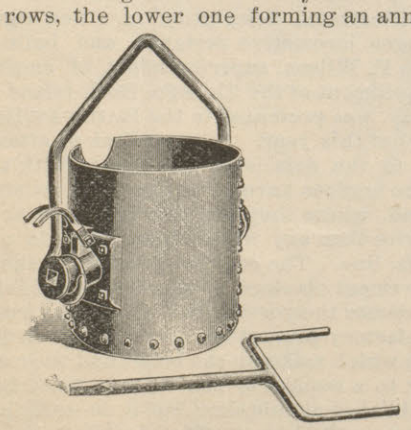


FIG. 5.—CAR WHEEL LADLE.

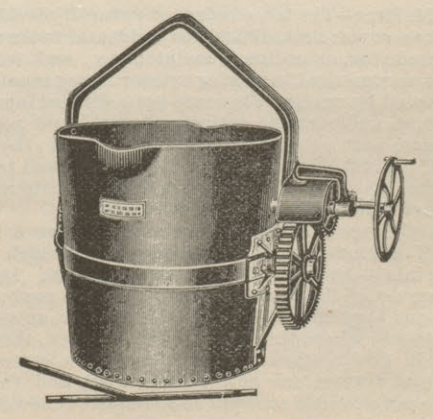


FIG. 6.—GEARED CRANE LADLE.

APPRENTICESHIP INDENTURES FOR MACHINERY MOLDERS.

A committee of the Western Foundrymens' Association submitted a report to that organization at its October meeting including three sets of indentures for application in commercial shops. The one referring to machinery molding is selected and is given in abstract as follows:

It seems to be an acknowledged fact that a recognized apprenticeship system is not only desirable, but necessary, to keep up the standard of efficiency being called for in the foundry business, and in order to cover the entire ground and take care of the various branches of the trade and to have the least possible complication, we have divided into different classes, with suitable terms as to time and compensation in each case.

In the class known as machinery molders, owing to the diversified kind of work, ranging from the lightest to

the heaviest, we believe a four-years' term short enough for any young man to be able to learn enough of the business to make him a proper mechanic, and where loam work is to be accomplished, we would advise one additional year on this special line. The youngest age at which your committee believes it advisable for an apprentice to take up this trade is 16 years, and the requirements or qualifications should be, first, a sound and strong body, well developed, a good common school education, coupled with a desire to learn this especial trade. The duties for each separate year and compensation for same will be fully set forth in a form of indenture submitted to you with this report.

We would strongly recommend the offering of a bonus for extra efficiency, and believe it would prove most beneficial if given at the end of each year; but in no case should the same be given unless the foreman is fully satisfied that the apprentice has fulfiled all requirements.

We would also advise keeping back 25 cents per week after the first year, as a guarantee of good faith and continuance. Along with this, we believe it would be to the best interest of all concerned to have the boy backed up by a parent or guardian to see to it that his interests are fully looked after.

INDENTURE FOR MACHINERY MOLDERS' APPRENTICE.

This agreement, entered into this . . . day of . . . A. D. 189 . . . between . . . . . a firm or corpoertion organized under the laws of the state of . . . . party of the first part, and . . . . . a minor, and . . . . . parent or guardian, parties of the second part, Witnesseth: That the said party of the first part agrees to take . . . . . party of the second part, into its employ and service for the period of four years from date for the purpose of learning the trade of iron molder, as carried on in its works, and that the said minor party of the second part shall truly and faithfully work and serve for said period in such capacities as the foreman may from time to time direct, and that he shall obey all rules and regulations of the works, and the party of the second part also agrees to abstain from the use of intoxicating liquors during the term of apprenticeship. The duties of the apprentice are defined as follows, but may be deviated from so long as it does not impair the apprentice's opportunity to learn the trade thoroughly: First year to be spent in core room to learn the making and use of cores, along with care of core boxes and necessary tools. Second year at light molding of various kinds and assisting in the care of patterns and helping molders, as occasion may require. Third year to be advanced to heavier and more difficult class of work as he may prove himself capable. Fourth year, the first nine months to be spent on the best class of work in the shop, whether made in dry or green sand, and the last three months of his term to be spent at the cupola, in order to gain some knowledge of the melting and mixing of irons, along with the care of cupola and ladles.

Compensation for services rendered while learning this trade shall be for first year $4 per week. For second year $5 per week. For third year $6 per week, and fourth year $7 per week with an additional bonus of $10 at the end of the first year, $20 at end of second year, $30 at end of third year, and $40 at the end of apprenticeship, it being understood that these bonuses are optional on the part of the party of the first part when he is thoroughly satisfied that the party of the second part has faithfully performed all requirements. Where an additional year on loam work is taken up, party of the second part shall receive for this year $8 per week, subject to a bonus of $50 at the finish, upon same conditions as previous years.

It is further agreed between the parties hereto that the party of the first part shall retain from the pay of the party of the second part the sum of 25 cents weekly until the end of the term of apprenticeship, and that the money so retained shall be forfeited to the party of the first part in case the party of the second part does not fully complete his term of apprenticeship or fails to give cheerful obedience to the rules of the works or to the proper authorities.

PRESERVATION OF METAL FRAMES FOR TENDERS AND CARS.*

Mr. E. M. Herr—The topic before us naturally divides itself into two parts; first, difficulties incidental to the regular wear and tear, or ordinary maintenance, and second, difficulties encountered in making extraordinary repairs or repairs caused by wrecks. These are again divided into two classes; first, underframes entirely of metal, and second, under-frames part metal and part wood. It is to the first division of the first class, namely, ordinary wear and tear of underframes entirely of metal, that I shall devote my attention, and principally to tender frames.

On the Chicago & Northwestern road we have a large number of all metal underframes on tenders which have now been in service from eight to twenty years. In general the service of these underframes has been good up to this time and they have given but little trouble, except in a few instances where the center sill has broken, through an error in design which has long since been corrected. These metal frames are now rusting away and though none have yet corroded so much as to require renewal, the last few years' experience indicates that the amount of corrosion is increasing in an advancing ratio which will soon make extensive repairs necessary, if, indeed, entire renewal does not have to take place. This corrosion is not uniform. Those in service a long time are often not more corroded than those in service not so long. This is no doubt due to a different kind of usage and difference in the kinds of water, as, indeed, the leakage from the tank has a great deal to do with the corrosion. The following table gives the principal data in regard to these sills:

Kind of Engine.	Cylinders.	Year Built	Cap. of Tank	Max. Corrosion on Iron Sills.	Min. Corrosion on Iron Sills.	Average Corrosion on Iron Sills.
				Per Cent.	Per Cent.	Per Cent.
8 wh. road...	16x24	1879	2350	10.7	4.5	7.0
" " ..	16 24	1880	2000	15.0	1.5	8.8
" " ..	16x24	1888	3000	11.2	5.7	7.8
6 wh. sw'ch'r	17x24	1888	2300	11.2	6.7	9.0

□I will sum it up in saying that the maximum amount of corrosion found in the sills of these tenders which have been in service two of them 16 or 17 years, the other two 8 or 9 years, amounts to from 10 7-10 to 15 per cent. per section. The minimum amount of corrosion varies from 1½ to 6 8-10 per cent, the average being from 7 to 9 per cent. This shows that the tender frames 8 and 9 years old are rusted worse in some cases than those 16 and 17 years in service. Two of these tenders have been in service on divisions running into Chicago, the other two on the Ashland division, between Milwaukee and Ashland on Lake Superior. The matter of rusting away of the underframes of cars has recently been examined and reported on by Mr. Tolmer, of the Eastern Railway of France. His investigation shows that cars built in 1869 have lost but 6 per cent, in 1874, 4 per cent, in 1875, 3 18-100per cent. The result of this investigation was a recommendation to paint all underframes every three years, cleaning away all rust and dirt and giving them two coats of paint. For frames so treated he estimated a life of from 50 to 60 years for the tender frames. This same action has been taken by the Chicago & Northwestern. We are now giving the frames of all tenders passing through our principal shops two coats of mineral paint, first cleaning them thoroughly from rust and corrosion. The extent of the corrosion is shown in the accompanying illustration.

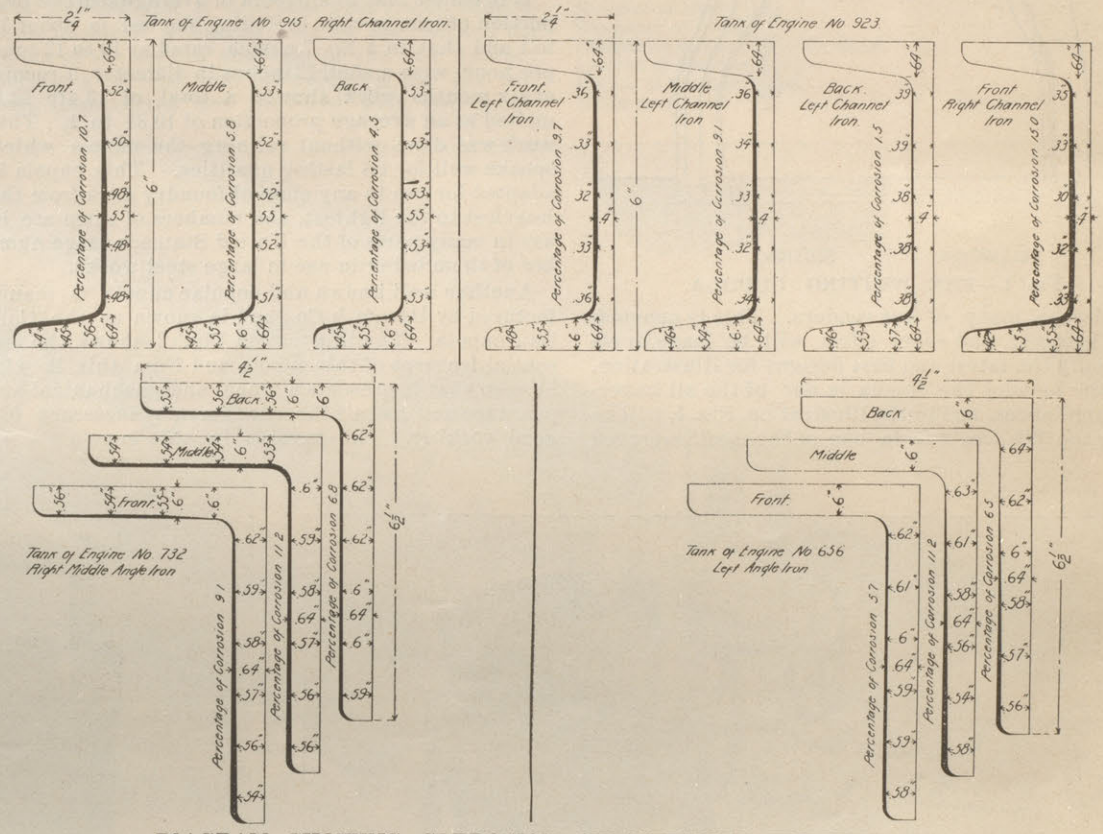


DIAGRAM SHOWING CORROSION OF METALLIC UNDERFRAMES.

In the cases investigated the framing was in place and was not removed for the purpose of this investigation, and it was impossible to measure the amount of the corrosion, but it was practically the same at the points where no corrosion is shown as at the other points of the same section. The maximum corrosion on these frames is in my opinion the one thing that limits their life, as the frames will have to be renewed or at least pieced out or repaired when they are rusted anywhere sufficiently to weaken them; and it seems to vary very much. Where the frames are covered by joining pieces corrosion is very light, but where the frames are exposed to the action of the moisture of the weather, the corrosion seems to be very rapid, and as I say, is increasing very rapidly in the last few years, the only time coming under my observation on this road.

It is considerable of a chore to clean these frames and paint them, but after they are once cleaned and thoroughly painted, it will be a much less difficult job to keep them painted if the matter is attended to as the tenders go through the shops. In this connection I believe (in fact, we are now investigating the matter), that the use of a spray in painting will be found very effective for this particular work, as some parts of these frames are very difficult to get at with the paint brush. We have experienced but very little difficulty with our tender frames from wear and tear due to severe service, or what might be called the damages due to traffic. The frames seem to stand up admirably under the service in which they are placed and require very few repairs indeed, except in cases of wreck, when of course they may require more or less expensive repairs, more expensive of course than with wooden tender frames. However, in our experience he frames are not apt to be nearly as badly damaged as those of wood.

I cannot say definitely as to what treatment the frames had when they were first built, but I think they had a coat of paint. It was put on them, I should judge, very hastily and not very thoroughly. The inaccessible parts of the frame were not covered at all, and it is those places which I believe are the ones that give us the greatest amount of corrosion now, and are showing an amount of corrosion sufficient to make it quite a serious matter as to their protection.

Mr. G. Gibbs—It may be difficult to entirely remove scale and rust from these frames in repainting, and if this is not done I think there will be poor success in getting paint to stick. In such cases I have found in a little different line of work, that coating the metal with raw linseed oil acts very well. The oil spreads very rapidly into the rust and scale, and even if there were no paint applied afterwards, the oil affords a very efficient protection for many months against further corrosion. I have done this more or less on pipe lines which carry signal connections in damp places in the ground to protect them from rusting. But of course where the metal is clean there is no question that good paint will be more durable than oil, and metal frames should never be used unless it is intended to keep them thoroughly painted. Tender frames would seem to be the hardest service we can put metal to, as we not only have the moisture from the air to deal with, but have periodical wetting from water which has drained from the coal carrying sulphuric acid in solution.

As to the best material with which to cover the corroded surfaces bridge engineers differ, some preferring red lead and others asphalt, or tar compounds. We use on our road a good quality of anhydrous iron oxide mineral paint and we consider it the best. The bridge department is very positive upon this point and I coincide in their opinion.

*Abstract of a discussion before the Western Railway Club.

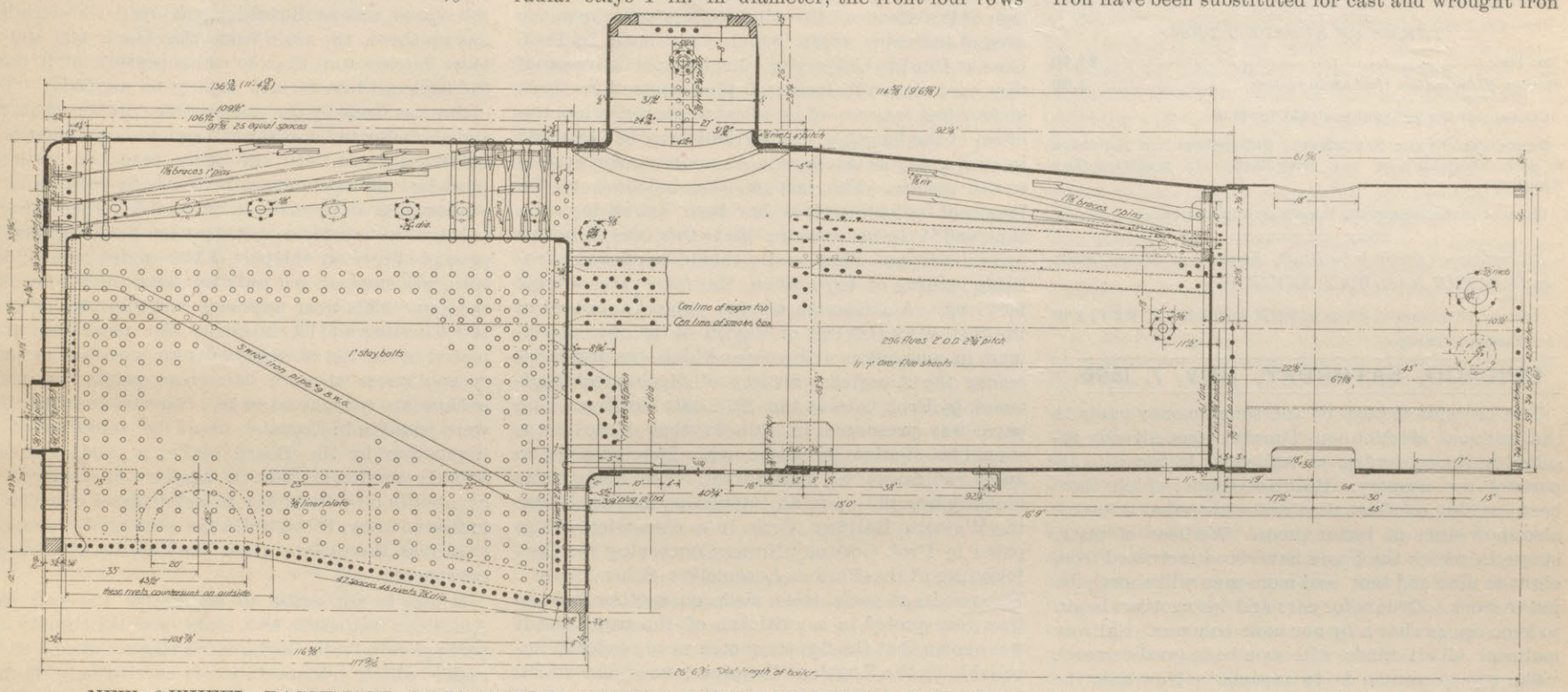
NEW EIGHT-WHEEL LOCOMOTIVE—CHICAGO, ROCK ISLAND & PACIFIC RY.

An illustrated description of a new eight-wheel passenger locomotive designed and built by Mr. George F. Wilson, superintendent of motive power and equipment of the Chicago, Rock Island & Pacific Railway, was presented in the RAILWAY REVIEW of May 30 of this year. A great deal of attention was given to the details of this design with the result that the engines have given excellent satisfaction on the road, where they are proving more economical in service than any which have been in use before on this line. The comparative figures showing the improvement obtained by this design are interesting and indicate the possibilities which may result from a satisfactory proportion and arrangement of the factors which make up the boiler and the machinery. Owing to a request by Mr. Wilson, these figures are not published at this time, but it is sufficient to say that the results have justified building two new locomotives of the same class as the one referred to, but in which a number of improvements have been made. The following table gives the principal dimensions of the new engines:

Cylinders	19½x26 in
Driving wheels, diam	78 in
Wheel base, driving	8 ft. 6 in

Weight on driving wheels	83,000 lbs
Weight on truck	42,000 lbs
Weight, total	125,000 lbs
Boiler pressure	190 lbs
Boiler, diam. at front end	61 in
Number of tubes	296
Length of tubes	11 ft. 7 in
Fire-box, length	108 in
Fire-box, width	33⅝ in
Grate area	24.2 sq. in
Heating surface, tubes	1725 sq. ft
Heating surface, fire-box	193.3 sq. ft
Heating surface, total	1998.3 sq. ft
Valve travel, maximum	6 in
Outside lap	1⅛ in
Inside lap	0
Fire brick arch	on 3 in. tubes
Water capacity of tender	4,000 gals
Coal carrying capacity of tender	8 tons

is the form of construction which employs but three sheets, the wagon top being carried to the front end of the boiler. The taper sheet is 92¼ in. long between rivet holes, and the outer fire-box sheet is 106 in. long, the intermediate course being 51 13/16 in. in length and 70 in. in diameter. The dome is located on the cylindrical sheet and it is evident that this construction gives a large amount of steam space. Instead of providing an additional dome for the safety valves and whistle they are mounted on the dome which contains the throttle. The crown staying is by radial stays 1 in. in diameter, the front four rows being sling stays. The rear axle comes under the fire-box and the mud ring is horizontal to a point 43½ in. from the rear, and from here it slopes downward toward the front. A generous number of handholds and plugs are provided, screw plugs being used chiefly. Three-inch plugs are provided under the boiler barrel, one of which is placed about a foot back from the smoke arch and the other under the dome. Three and one-quarter inch plugs are provided in the outer fire-box sheets opposite the arch tubes for the purpose of cleaning them. A 2¼ in. plug is placed in the front water leg and seven of the same size are provided on each side of the fire-box through which the crown sheet may be reached from the outside. The water legs taper at the back and sides, the space at the back is 4½ in. wide at the crown sheet, and 3½ in. at the mud ring, the spaces at the sides being 3½ in. at the mud ring, while the space at the front is 4 in. with the sheets parallel.



NEW 8-WHEEL PASSENGER LOCOMOTIVE, CHICAGO, ROCK ISLAND & PACIFIC RY.—FIG. 1.—LONGITUDINAL SECTION OF BOILER.

These engines are equipped with the Leach air sanding apparatus and with an air grate shaking attachment which has proved to be a success on the engine previously described. The most interesting features of this design are the use of cast and pressed steel and malleable iron and the construction of the boiler. The details of the boiler are shown in the accompanying illustrations, which present a longitudinal section through the boiler and the fire-box and cross-sections through the front sheet and through the fire-box. The most noticeable feature

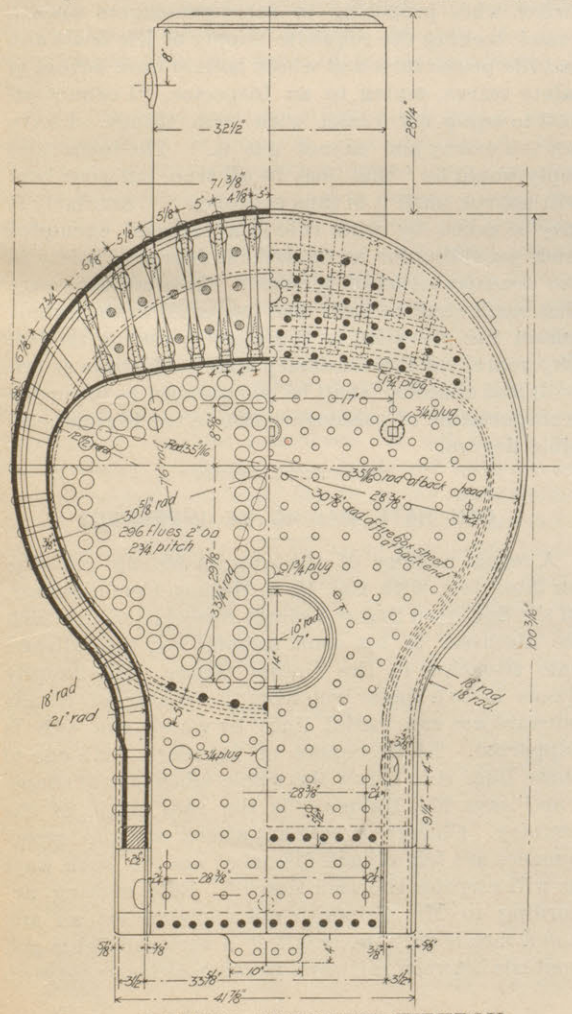


FIG. 2.—SECTION THROUGH □ FIREBOX.

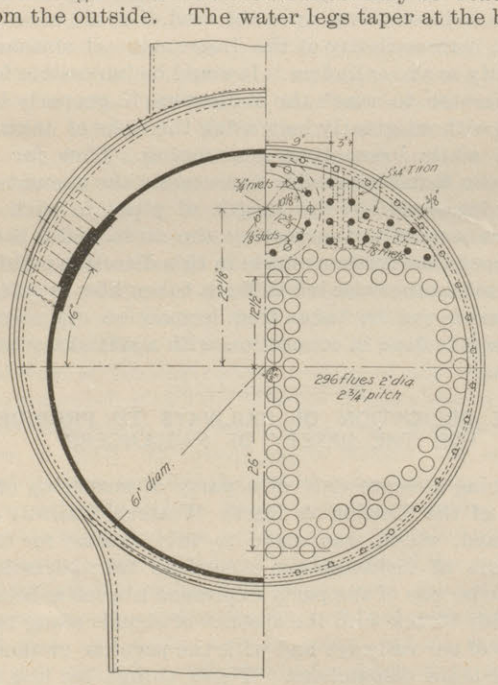


FIG. 3.—SECTION THROUGH FRONT COURSE.

This boiler is an example of a good design and equally good construction for meeting the severe demands of modern high speed locomotives. The use of three plates beside giving a large steam space, makes it possible to save one circumferential seam. It is evident that the construction of a boiler from these drawings requires a shop equipment which is of the best and up to date, and the Brooks Locomotive Works, the builders of the three under consideration, are entitled to credit for their work, which was especially well executed. The design was worked out completely by Mr. Wilson, under whose direction the drawings were prepared.

As has been clearly pointed out by Mr. Wilson, the tractive and steaming qualities of the locomotive constitute one feature of a good design, and another the importance of which is perhaps not fully appreciated, is a combination of lightness and strength of the material employed. In the two new locomotives, cast and pressed steel and malleable iron have been substituted for cast and wrought iron in liberal proportions, for the purpose of making the weight as low, as possible as far as the castings are concerned, so as to permit of making up for their lightness in the way of additional boiler power, and the results are apparently highly satisfactory. In the locomotive which was illustrated last summer, the cast details except the driving wheels were principally of cast iron and as steel and malleable iron have been used for many of the same parts of the two engines just constructed, an excellent opportunity is offered for comparing the weights which are given in the following table:

	Cast Iron. 1101	Steel. 1102-1103	Difference.	Per cent Lighter.
Center castings for Engine Truck...	1561	930	631	40
Deck plate.....	1346	797	549	40
Driving boxes.....	2072	1600	472	23
Front for smoke Box.....	774	416*	368	44
	5723	3743	1980	34.5
Malleable Iron.				
Draw castings for Pilot	207	128	79	38
Male center...	498	381	117	23
Pilot shoe.....	58	26	32	55
Corner brackets...	32	22	10	31
	795	557	238	30

*Pressed steel.

The total amount of cast iron in the first of the three engines which has given place to cast and pressed steel and malleable iron in the two just built is 6518 lbs. The weight of the cast steel and malleable iron substituted is 4300 lbs. The gain being 2218 lbs. saved by the use of these materials which is about 33 per cent of the total weight of the castings employed. The total amount of cast steel used in the construction of one of the new locomotives is 21,593 lbs. The total amount of malleable iron is 557 lbs. the weight of each item being given in the table already referred to. The large amount of weight of the cast steel is due to the fact that the frames are made of this material, they being furnished by the American Steel Casting Co. of Thurlow, Pa. The driving wheels, driving boxes, truck centers, deck plate and all of the other cast steel details, were furnished by the Sargent Company of Chicago. Speaking of the use of cast steel in locomotive construction Mr. Wilson writes, "In connection with this it may be mentioned that we had two pieces of cast steel forged and welded in our blacksmith shop. There was no difficulty in forging and welding these pieces and when put in the testing machine, the specimen broke across the weld at a load of 70,200 lbs. per square inch. The possibility of welding cast steel is of course one of the most important properties of this material for use in engine frames."

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CHICAGO, SATURDAY, NOV. 7, 1896.

THE decisive victory of the sound money party in the national election on Tuesday, has already resulted in the reopening of mills and factories in all parts of the country. Railroad shops which have been running on short time and with reduced forces, also show signs of better times. We hear of many shops in which the hours have been increased from eight to nine and ten; and more men will shortly be put to work. Orders for cars and locomotives begin to loom up, as shown by our news columns. Railway material of all kinds will soon be in good demand. "The way to resume is to resume." Now that the financial issue is settled, those who are entitled to get money from the banks can get it. The embargo is removed. Business will not come in a flood, but industry and enterprise can now be sure of their legitimate reward. It is a time for courageous effort, and for plucky determination.

REFERRING to the injunction which has been granted against the joint traffic association, upon the application of the Cleveland, St. Louis & Kansas City Road, the *Railway World* says, "The interstate law forbids the division of traffic by competing railroads". Just where in the law our contemporary finds this prohibition, is not clear. Were the statement made by a journal outside the technical ranks it would be ascribed to a confusion of terms but that a paper devoted to the discussion of railroad questions should unwittingly make use of such language is past comprehension. The Pennsylvania road is generally understood to be lukewarm in regard to the proposition to amend the pooling clause of the interstate commerce law, and the *Railway World*, possibly because of its vicinage, is ordinarily in accord with the accepted opinions of the company concerning such subjects. All of which leads one to wonder if the Pennsylvania road on the ground of illegality, looks with disfavor upon that portion of the joint traffic agreement which provides for a physical division of traffic.

THE possibility of a reduction in steel rail quotations has aroused some fresh interest in the steel rail market. Persons who are familiar with the situation know that the amount of urgent railway construction requirements, to say nothing of most urgent repairs, is very large. Careful inquiry develops the fact that large orders will probably be placed in December. The present price, $28.00, is objected to most strenuously by some prospective buyers. There has been very little movement in billets, but great activity has prevailed in Bessemer. In view of decreased production, stronger prices for all kinds of crude iron are quite probable, and this lends force to the belief that large crude iron orders will not be long delayed. While everything points to a remarkable activity next year it is not safe to positively assert that the reaction is right at hand. So many outside influences have to be reckoned with that it is necessary to proceed slowly in casting results. Foreign capitalists and foreign interests may want to know whether Tuesday's verdict was a final one or whether it is good only for four years.

IT SEEMS very difficult for engineers to believe that nearly, if not quite all, of the data which has been taken from locomotive cylinders by means of the indicator, and this applies to other high speed engines as well, is valueless, except such as may have been secured through the use of very short pipe connections between the cylinder and the indicator, yet the conclusions drawn from an investigation of the effect of the pipe connections upon the area of indicator cards, which were made by Prof. Goss at Purdue University, furnish conclusive proof that cards taken by means of pipe connections three or four feet long are of no value whatever unless the effect of the length of connections may be measured in such a way as to permit of applying corrections to the results. The fact of the influence of the length of indicator pipes has been known for some time and it seems strange that this should not be recognized, and that cards should be offered as reliable records of tests when the pipes are several feet long. A discussion of this subject appeared in the RAILWAY REVIEW of May 30 of the current volume, in connection with a paper which was presented before the American Society of Mechanical Engineers, by Prof. Goss at the St. Louis meeting. The paper was presented in full in that issue and it should be studied by those who have occasion to apply indicators to locomotives. The subject was recently brought up in an interesting manner before the Western Railway Club in a discussion of the paper by Prof. Goss on "Notes Concerning the Performance of the Purdue Locomotive Schenectady". The results of some tests made on another locomotive were quoted in a criticism of the paper and it was shown that the figures quoted were rendered unreliable by the length of the pipe connections which was four feet. Without knowing the exact error, Prof. Goss considered it probable that some of the cards offered in the criticism should be corrected by about seventeen per cent, which is enough to render almost all the records valueless. The error introduced by the pipe connections depends largely upon the speed as well as the length of the pipes and its effect is to retard the indicator pencil and to give cards showing pressures higher than the true ones during a large part of the expansion, and pressures lower than the true ones during compression. The result is that the cards are drawn with larger areas than the actual cylinder pressures would produce. The situation is discouraging to those who are obliged to apply indicators to locomotives upon the road, if at all, because of the inaccessibility of the instruments if attached directly to the cylinders. It would be impossible for an operator to reach the indicators if properly located without greatly increasing the risks of taking cards while locomotives are running. Thus far it has been found impossible to ascertain the amount of error introduced by the length of pipes in such a way as to permit of correcting the cards, and it is to be hoped that further efforts in this direction will be successful, otherwise it is difficult to see how satisfactory cards can be taken from locomotive cylinders, unless it is done in connection with a stationary test plant.

THE OBLIGATION OF RAILWAYS TO PROVIDE FOR THE SAFETY OF PASSENGERS.

During a recent visit of a party of managing officers of the London & North Western Railway of England, which was made to this country for the purpose of investigating American transportation methods, one of the party expressed himself as being forcibly struck with the absence of signals along the lines of our railways and with the peculiar methods of our train dispatchers. These things led him to think that successful train operation on some lines was a matter in which Providence exerted considerable influence. It is not strange that such an impression should be received by one who is familiar with English methods of signaling, and this gentleman was very nearly right in his conclusion. What other conclusion could he reach after riding over roads which cross rivers by means of drawbridges which are not protected by interlocking appliances, and where even the rule requiring trains to come to a full stop before crossing the bridge is not enforced? Almost immediately after this observation was made two cases of extremely narrow escapes from accidents were recorded on different roads in New England, both of them being at drawbridges and one of them at the exact spot where a terrible disaster occurred some forty years ago. One of these bridges was equipped with derails and interlocked semaphore signals; the other had a time honored gate system of signals, in which the gates were located five hundred feet from the draw. In the first instance a train approached under comparatively low speed, and as the bridge was open the derailing switch threw the train from the track and did no more damage to it than to roll a portion of it down the bank without serious injury to anybody. The claim was made by the locomotive runner that the signals indicated "go-ahead" and his statement is to be investigated. In the other case the train approached an open draw in the early evening in an atmosphere which made it impossible to see the signal light at a distance sufficient for stopping, and by prompt efforts on the part of the engine runner, the train was stopped and only the locomotive went into the gap. This near approach to a "horror" is in itself startling and it furnishes one more item to be placed in the list of arguments for satisfactory safety appliances at such dangerous points as drawbridges are recognized to be. Such an accident, if it were possible in England, would be subjected to an inquisition by the Board of Trade, and it is confidently predicted that a similar authority will eventually be called forth to act in cases of accident in this country, if the railways continue to neglect to protect themselves from the liability of these occurrences.

It may be not amiss to emphasize the fact that American railroads, as a class, are lamentably and perhaps criminally negligent in respect of conditions under which transportatiou is carried on. It may be claimed that were it obligatory to provide all the appliances necessary to the safest possible operation of trains, many roads would not be built and others would find themselves seriously embarrassed, but it is at least doubtful if the alternative justifies present practice. Indeed it may be asserted without fear of successful contradiction, that a railroad before it can properly engage in business as a common carrier is in the nature of the case, under obligations to provide for the utmost possible safety of the persons whom it engages to transport. The fact that it has not and cannot supply the money necessary for such a purpose, furnishes no argument against the proposition. What would be thought of a steamboat owner, who, proposing to carry passengers upon a vessel lacking the requisite supply of life boats and and life preservers, and whose boilers were devoid of safety valves, saying to an inspector, "I cannot afford to equip my vessel with such things. I have not the money and cannot get it." The inspectors reply would be "that may be all true, but your boat will not run until it is thus equipped." Similarly it may be asked by what rule is a railroad exempted from providing for an equivalent degree of safety in the transportation of persons? It is not necessary that roads shall be built and operated to the extent which has prevailed in this country during the last fifty years, but it is necessary that such roads as are built and operated shall be so equipped as to render transportation of passengers safe in the highest possible degree.

CAN RATE MAKING BE IMPROVED?

A recent number of the Atlanta Journal contains an interview with Col. H. S. Haines, Commissioner of the Southern States Freight Association, in which he discusses in his usual forceful way the railroad rate situation in the United States. He happily likens it to a spider web from the center of which outward are run radial lines by which the web is supported. To disconnect or interfere with one of these lines is to throw the whole fabric out of shape. "So," says Mr. Haines, "is the rate fabric of the country. Change a rate anywhere, and the consequences are felt at such distances and in such ways as will surprise the uninitiated." Rate making, according to Mr. Haines, is not a science but an art, and a rate is only the result of a series of fights and contests between railways, between cities, or between

commodities. There is a continual contest going on and the resultant rate is a compromise between conflicting interests and influences, the tendency of which is always downward. He frankly states that although he was for years chairman of the rate committee of the Southern Railway & Steamship Association, he cannot give any general principle of rate making that would apply in all cases, and that to give the history of any particular rate it would be necessary to go back twenty years or more.

Than Mr. Haines, perhaps no one is better qualified to speak authoritively upon the rate question as it exists upon American railroads at the present time. Unlike most men actively engaged in the railroad service, he is a close student of its problems, and is not satisfied without knowing the reasons for things as they exist and usually attempting to improve the situation wherever possible. It is, however, to be feared that in this connection Mr. Haines has permitted himself to be controlled by existing conditions; possibly from a failure to see how an improvement could be made, but more probably because of a conviction that railroads were not likely to change their present practice in the absence of a compeling force. It is not conceivable that a man of his perspicacity would defend the methods of rate making now in vogue in the United States, as the best possible, but only the best possible under the circumstanees. Given other conditions, and it is believed that he in common with other students of the question, would advocate the establishment of a basis which would be in some degree defensible.

The one thing which is perhaps the most responsible for the chaotic condition of rate making is the present system of classification and the consequent divorcement of rates from the commodities to which they apply. Strange as it may seem, classification and rates have little to do with each other until they meet in connection with the actual transportation of comodities. The fitness of one for the other, is a matter of little moment to those who have the arrangement of both. The classicfiation committee passing upon the relation of articles, or more properly speaking, the particular class in which the articles under consideration shall be placed, largely regardless of their relation to other articles, are not concerned with the rates which are to apply thereon; and on the other hand, the rate committee whose province it is to fix the schedule of charges between various points, are not in the least concerned and take no thought of the results reached by the classification committee. Not that any criticism upon the work of these committees should be expressed. It is the only way in which the work can be carried on under the present methods, the system, rather than the users of the system being at fault.

It may perhaps be true that rate making as at present conducted. is properly characterized by Mr. Haines as an art instead of a science, but it does not follow that rate making cannot be made a science instead of an art, nor even that it should not be done. It is admitted that owing to the universal use of present methods the railroads are not likely to voluntarily abandon their present practice and adopt another even though it may be shown to be more superior. Neither was it likely that in the absence of legislation railroads would have adopted the reforms that have been accomplished by the enactment of the act to regulate commerce. It will hardly be denied that the reforms thus instituted have not as a whole proved a material benefit to the roads themselves, and it is no more doubted that if the railroads were obliged by law to adopt a scientific basis for rate making it could not only be done, but after it was done would be admitted to be beneficial in the highest degree. Not only so, but it is difficult to see how, if the spirit of the law is to be carried out, and discrimination avoided the present system of rate making can be perpetuated. The commerce of the United States is too important to be left to the hap hazard determination of committees controlled, as they needs must be, by preference, prejudice or self interest; or to compromises forced at the end of a severe contest. The commerce of the country is also too multiplex to be confined in a straight jacket composed of a few classes simply because to enlarge the schedule is to make it too cumbersome, and to change the method is too much trouble. Now that the principle of charging what the traffic should bear is coming to be admitted as the proper one, it is time that other and better methods of rate making were adopted.

LUBRICATION OF VALVES AND CYLINDERS.

In a set of questions recently compiled by the mechanical officers of a large road for the purpose of inducing the men who are employed upon locomotives to endeavor to improve their qualifications for doing their work economically, is the very simple one "How would you lubricate a locomotive?" This interrogation seems easy enough and perhaps many mechanical railroad officers would set it aside as too simple and commonplace to be used in such a connection. Instead of being an unnecessarily easy question it is indeed one of the difficult problems of the day to get satisfactory lubrication of locomotives with particular reference to valves and cylinders. It is well known that the friction of dry valves is very high and not the least of the undesirable effects of any dry surfaces is the rapid tearing or abrasion of the valves and the seats. Another bad effect will be referred to later. The abrasion of the valve upon its seat is a general source of trouble and sometimes enough cutting occurs in a single trip to render it necessary to face off the valves and the seats. The difficulties in lubricating these surfaces have raised the question as to the efficiency of the latest improved automatic sight feed lubricators, and this has gone to the extent of questioning whether such lubricators actually deliver any oil to the valves while steam pressure is on the cylinders, or in other words, when the throttle is open.

In a test recently made upon automatic sight feed lubricators of the highest grades it was found that in the case of one type with 140 pounds boiler pressure and running the engine at 25 miles per hour, with a full throttle and feeding oil at the rate of 60 drops per minute, 30 minutes were required before the first of the oil reached the cylinders. The test was made in such a way that the discharge of oil into the top of the steam chest could be seen through glass tubes. This case perhaps does not fairly represent conditions of practice because of the fact that the pipes were carefully blown out before the test commenced. To compare this form of lubricator with another, of a different make, a second test was made which brought the oil down in 15 minutes after starting. With subsequent tests in the case of the first lubricator, no oil appeared at the cylinder upon shutting down the engine, but in the case of the second one, the closing of the throttle was very soon followed by a discharge of oil. From these experiments, the question may fairly be raised as to what will be likely to happen to the valves of an engine during thirty minutes after starting, if the lubricators always work in this way. They do not always act quite as sluggishly and especially when they have not been previously blown out and cleared of the oil, but their reliability is brought into serious question by such tests and it has been suggested with reason that it might be well to go back to the old form of cups.

The necessity for good lubrication of locomotive valves is very plainly indicated by the remarks of Mr. E. M. Herr, of the Chicago & North Western Railway, at the September meeting of the Western Railway Club which are referred to elsewhere in this issue, and which indicate conclusively that the friction of badly lubricated valves affects the steam distribution and also the actual valve opening so as to muzzle the engine to an astonishing extent, the trouble being due to a springing of the valve motion connections, owing to the high friction of the valves All of this ground has been pretty well gone over in marine practice and it may be said that satisfactory solutions are to be seen in cases where marine engines are run continuonsly for thirty days or so, without cutting either the valves or the seats. In that service the fact is appreciated that internal friction of an engine is often so high as to require 14 per cent. of the power of the engine to move itself, whereas the proportion of the power required to overcome external friction is but 6 per cent.

The fact that certain forms of steam pumps are able to run long periods unlubricated and without cutting is not a satisfactory argument that steam cylinders do not require unguents. The remark is often heard that the water of condensation is a lubricant, but there is the best of authority for believing that this is not true and that water between metallic surfaces increases rather than reduces the friction of sliding, and that it may therefore be termed an anti-lubricant in the case of a piston and cylinder or a valve and a valve seat. The presence of water in a cylinder has an influence on the cutting of the surfaces, and it does tend to prevent such action. In this, however, it serves merely to keep down the temperature caused by the friction, the high temperature being an important contributor to the abrasion It becomes more and more apparent with the investigation of the sight feed lubricator as ordinarily used, on locomotives that it does not carry oil to the cylinder regularly and the effect of the water brought over in the steam and also that which is due to condensation is probably sufficient in most cases to carry away the heat rapidly enough to prevent cutting. It is obviously unsafe and unwise to rely upon this action of the water which does not reduce friction, and better lubrication may be set down as an absolute necessity. The man who will solve the problem of getting oil to the surfaces under consideration as regularly as it passes through the sight glasses of the lubricators will make a "barrel of money."

A lubricating system which has been worked out by a prominent foreign marine engineer employs the upward moving drop in sight feed lubricators only in cases where the drop may always move upward in its passage through the pipes to the cylinder. In other words, he places the lubricator and the connecting pipes below the cylinder, and feeds as nearly vertically upward as possible. Whenever he uses a downward moving drop he finds it necessary to make the connecting pipe so large that it will not retain water, which acts to hold the oil from dropping through the pipe. The downward moving drop system depends upon the superior lightness of oil as against steam, whereas the upward moving drop depends upon the oil being lighter than water. From this successful system, together with the experiments which have recently been conducted upon the St. Paul & Duluth Railroad, described before the Northwest Railway Club, an account of which is presented elsewhere in this issue, it appears necessary to use larger pipes between the lubricators and the cylinders if they are to be used in the same manner as at present, and it is believed that this simple change may remove a large part of the difficulty. If this does not afford relief other plans should be tried, the necessity of improvement having been fully established.

THE RAILWAY AS A LUMBER EQUALIZER.

The subjoined article, taken from the Timberman, is well worth reading. It is in accord with the views of this journal as frequently expressed:

The railroad has come to be the most controling factor in the distribution of lumber.

The railroads level up and level down, making equality where there was inequality, and making competition possible under circumstances which would seem to preclude successful competition. They do both more and less than would seem could be reasonably expected of them. In some instances they will maintain a rate absurdly high as compared with others in effect, or may make reductions that are almost inexplicable to the layman. The very uncertainty of railroad policy tends to increase the demands upon the roads beyond a point of reason. We note in the Railway Review this clause:

When the trans-continental roads first inaugurated a lumber rate that would permit the laying down at central and eastern states, points the better class of lumber produced upon the coast,the additional market thereby made available was hailed with delight and eagerly availed of: but with the growth of trade came new demands, and the roads are now being importuned for, and in some cases berated because of their refusal to make, a rate sufficiently low to permit these producers to ship the lower grades of lumber to eastern markets in competition with the local product. It is claimed that a 40 cent rate should be made for this purpose, but it is not shown how such a rate can be maintained with any profit to the roads. In view of the very common practice which has heretofore prevailed upon the railroads, it must be confessed that abundant reason exists for the prevalence of this idea among shippers, but it is time that it was corrected. The railroads were never intended to equalize markets except so far as reasonable transportation charges might offset the difference in cost of production between localities.

The article concludes with the statement:

If a wise policy prevail, Pacific coast lumbermen will never ship low grades of lumber for ordinary use to the central and eastern states markets.

It is really wonderful how much has been done, and in some cases, wonderful how little has been done for the business by the railroad companies. One of the most remarkable instances of leveling all natural disadvantages, and placing competitive manufacturers on an equality over a wide extent of territory, is furnished in the south. Practically the entire yellow pine business of the southwest is done on a flat rate, which is applicable to all the mills to common points. Mills that are 400 or 800 miles from destination have the same rate. Through the territory east of the river the same condition largely prevails, so that the celebrated 22-cent rate on yellow pine applies on probably four-fifths of the entire yellow pine product to the chief consuming territories for the products of the various producing districts.

The idea of the cost of transportation, as far as any particular mill output is concerned, seems to have been laid aside, the railroads being concerned merely with the total result of the business, the losses on the long hauls being made up by the extraordinary profits on the short hauls. It is apparently much on the principle according to which streets railways are operated, the man who pays his nickel for a half-mile ride contributing to the cost of transportation of the man who rides ten miles for the same sum. The apparent injustice to the railroad of some of these rates is doubtless compensated for by the simplification of the rates and the increase in the aggregate business. Yet the man who is operating a plant 300 miles from his market may sometime make effective a complaint against the railroad which charges him as much for 300 miles of hauling as his competitor for a thousand-mile haul.

In the central-northern territory a different and less liberal policy has been pursued, yet one that has seemed more just on the whole. Distance and cost of transportation have had more to do with the rate than in the south, and yet in the north there have been many instances of where the railroads have ignored natural conditions and have frankly applied the policy of charging the traffic what it could bear. The railroad men explain that certain sections should pay higher rates, because their timber costs them less or because their logging expense is lighter than that in some competitive section, and yet when such competition arose as affected their revenues they promptly and frankly ignored this argument in favor of some other. The new elements brought in to the rate problem by the car ferry system on the lakes seem to have been the initiative for prospective radical changes in the methods of handling the lumber business in the white pine country. But all these things simply tend to show that the theories upon which freight tariffs are built are but tentative ones; that freight rates are in the experimental stage, and that neither are freight rates themselves nor the principles upon which they are founded, on a permanent basis.

Those who are making investments in timber and lumber producing plants should, therefore not be too certain as to the future rates which they will enjoy. The condition on the Pacific coast is an instance in point. Freight rates which would admit the shipment of good lumber to the east have encouraged the erection of mills and the extension of trade with the east on the apparent assumption that the entire mill product was of the better grades; but it is being found that on the Pacific coast, as well as elsewhere, no business can be run satisfactorily which can find a market for nothing but clear lumber. The cost of logging and manufacture must be expended upon the lower grades whether they are sold or not. If they are not sold at some price the upper grades are handicapped to just that amount. Yet, as our railroad contemporary suggests, there is no likelihood that common lumber can be shipped from the Pacific coast to the east in important quantities. The market for this class of lumber must be mainly local, reaching the east only to the point where it comes into price competition with white and yellow pine lumber of corresponding grades. If that natural territory is large enough to take care of the low grade output of the Pacific coast mills, well and good, but if not, the industry is handicapped to just that extent. A similar difficulty has been found in the south, though it is now being overcome partly by concessions in rates on low grade product and partly by the natural extension of the territory owing to a diminished output of white pine. But it is an important question which has not been sufficiently considered by investors.

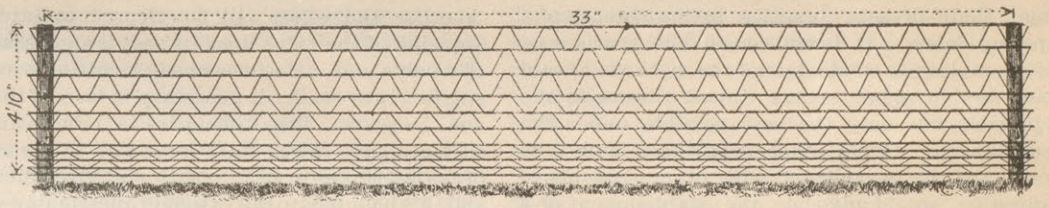
Looking toward the future, it is difficult to say what the future in rates will be. Eventually it would seem that business must come down to a logical, just and permanent basis. The cost of the service rendered must be taken into account more, we believe, than at present. At the same time, there may be throughout the country a more general application of the flat rate theory by which the whole of extensive territories are put upon a common basis.

If the development take this course, it would mean perhaps, a new advantage to the northern lumber products which have in the past been treated less generously in this respect than those of the south and the Pacific coast.

As it becomes less possible for the railroads to assume an arbitrary position it becomes more necessary for them to assume one based on reason. The development of this subject is one fraught with serious consequences to the business community upon the solution reached, as on state or national supervision, on the influence of traffic associations and of business organizations depends the success or failure of long-time investments.

THE NEW MCMULLEN WIRE FENCE.

The McMullen Woven Wire Fence Company of Chicago has recently brought out a new design of wire fence which, as may be seen from the accompanying illustration, presents a neat and substantial appearance. The panel length, or distance between posts is 33 ft. and there are eleven horizontal wires, ach of which is a cable, the top one being composed of four and the others of two No. 12 wires each. The three upper spaces are 9 in. each, the three center ones are 6 in. each and the three lower ones 3½ in. The binding or cross wires are No. 14,gage and woven into the cables, making a firmly united construction. A sample of this fence was exhibited at the recent convention of the Roadmasters' Association, where it received many favorable comments. Mr. Edmund G. Fisher, as announced in the issue of October 24, will have the handling of this fence in railroad lines.



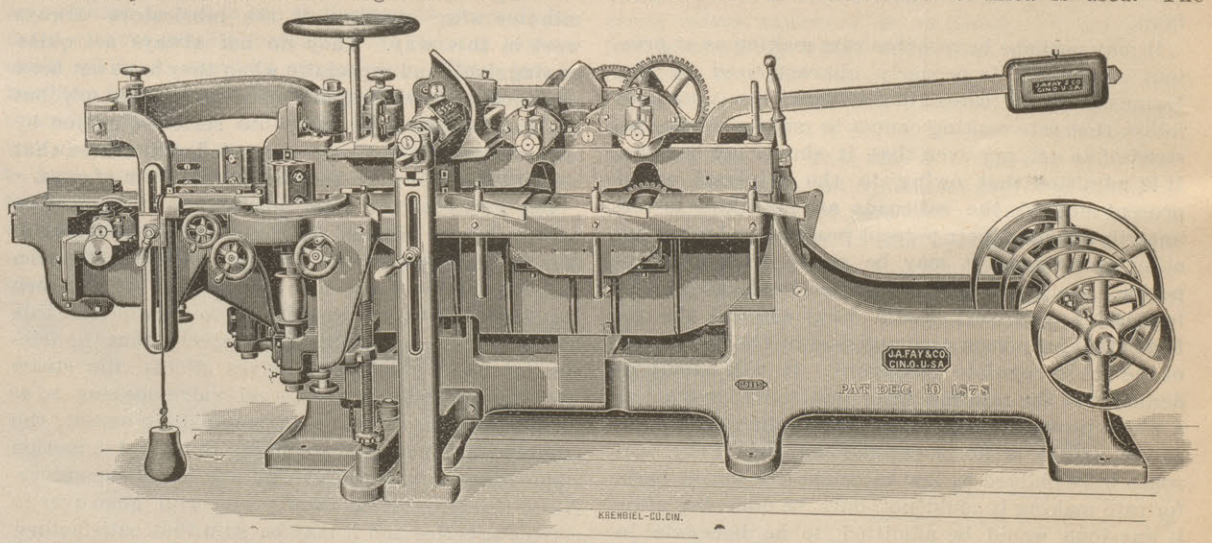
THE NEW McMULLEN WIRE FENCE.

A NEW EXTRA HEAVY MOLDING MACHINE.

A new pattern of heavy molding machine recently placed upon the market by Messrs. J. A.Fay & Co.,of 299-319 W. Front St., Cincinnati,is illustrated by the accompanying engraving. This machine is unusually strong and substantial in all of its working parts and it is adapted to work on pieces 10, 12 and 14 inches in width. The bed is raised by means of three screws The matcher clip is weighted and the machine is fitted with a swinging pressure bonnet, a swinging bar over the lower head and feed rolls with outside bearings.

The framing is massive, all joints being planed and c urately fitted and bolted together. Tne bed long bearings are lead ground, and each one is fitted with a four side, slotted steel forged head and a pair of straight knives. The upper cutter head is supported in a heavy gateway that is adjustable across the frame and has also an outside bearing support that is mounted on a heavy stand secured to the frame. The lower cutter head is supported in a frame that is vertically and laterally adjustable independent of the bed. Throat plates adjustable to and from the cut are located in the table and upon each side of the head.

The side cutting spindles and heads are supported on the bed in such a manner that the pull of the belts is against the framing. They are adjustable vertically, laterally and angularly, and locking devices are provided both at top and bottom to hold them rigidly in position. An adjustable step on the hangers takes up any end play that may occur. The chip breaker for the outside side head is adjustable, in conjunction with the fence behind the cut, across the bed by means of a hand wheel and screw. The improved weighting device insures a uniform pressure on the material. The pressure bar over the lower head is adjustable in all directions and can be swung back out of the way for access to it. The swinging pressure bonnet in front of the upper head and the pressure bar behind it are both adjustable to and from the cut and hold the material firmly to the bed.



A NEW EXTRA HEAVY MOLDING MACHINE.

The feeding mechanism consists of four rolls, two above the bed and two in it, all driven by a powerful system of expansion gearing. The upper rolls are mounted in swinging frames and always raise parallel with bed, and are weighted to secure uniform pressure. The roll shafts are large in diameter and have outside bearings which are readily removed for changing the rolls. Four speeds of feed are provided viz: 10, 16, 24 and 36 ft. per minute. There is a shop number on the machine and a number on each casting by which they may by identified. The countershaft is attached to the frame of the machine and has tight and loose pulleys 12x8 in. and is designed to make 1,000 revolutions.

wide and heavy and is gibbed to the frame with provision for taking up wear, and it is raised and lowered by means of three screws, two inside the frame and one outside supporting the bed at the front and rendering it easy of adjustment. When set to any required position it is clamped securely by a lever in front. An adjustable throat piece is located beneath the main cutter head to admit of working cutters the full thickness of the material. The extension behind the lower cutter head is hinged and swings aside when it is desired to adjust or sharpen knives, and it also swings down for the same purpose when material is on the bed.

The cutting spindles are large in diameter, being $1\frac{5}{16}$ in. where the heads are applied. They run in

A MICA BOILER COVERING.

The Mica Boiler Covering Company of Toronto, Canada, has been doing a very successful business n furnishing boiler and steam pipe coverings made of mica. The covering is manufactured in two classes, one for boilers and cylinders, and the other for steam and hot and cold water pipes. For both classes of service the best of mica is used. The mica is split and divided until the layers or films are as thin as the finest tissue paper. These films or flakes are then crimped or fluted which adds largely to their bulk and diffuses quantities of air through them. The flakes are then quilted between galvanized wire netting and canvas for use for boiler and cylinder coverings where an absolutely fire proof construction is desired. Canvas and paper are entirely discarded and the wire netting is used on both sides. This gives a covering impervious to heat, water or frost and one which is practically indestructable. A finished sheet of the covering which is made in convenient sized sections somewhat resembles a porous flexible mattress and pieces may be easily cut to fit any shape by snipping

the wire netting and then sawing through the mica with a fine toothed saw.

Considerable quantities of this lagging have been used on the Michigan Central Railway and also on the Canadian Pacific for covering locomotive boilers and has given excellent satisfaction. A very interesting test was made on the Michigan Central Railroad consisting of a comparison between two engines, one of them having wood lagging ⅞ inches thick, an air space ⅝ inches beneath the wood and a sheet iron jacket outside. The second engine was covered with mattresses of mica about 1½ in. thick and had a sheet iron jacket outside. One hundred thirty-eight pounds of steam was raised on engine 383 which had a mica covering and 140 lbs. on the other. The fires were then drawn and the engines allowed to stand. The following table shows the fall of pressure in the engines records being taken every 30 minutes:

Time.	Pressure of Engine Gage. No. 382.	No. 383.	Fall of Pressure. No. 382.	No. 383
9.30	140 lbs.	138 lbs.	-	-
10.00	116 "	124 "	24	14
10.30	95 "	108 "	21	16
11.00	76 "	94 "	19	14
11.30	61 "	81 "	15	13
12.00	50 "	71 "	11	10
12.30	40 "	62 "	10	9
1.00	32 "	54 "	8	8
1.30	25 "	47 "	7	7
2.00	21 "	41 "	4	6
2.30	16 "	36 "	5	5
3.00	12 "	31 "	4	5
3.30	9 "	25 "	3	6
4.00	6 "	23 "	3	2
4.30	2 "	17 "	4	6
5.00	0 "	14 "	2	3
5.30	0 "	11 "		3
5.55	Whistle valve opened.			
6.00		9 "		2
6.30		7 "		2
7.00		4 "		3
7.30		2 "		2
8.00		0 "		0
8.30		0 "		
9.02	Whistle valve opened.			

In engine No. 382 with the wood lagging, 140 lbs of boiler pressure were entirely gone in 8 hours 25 minutes but the other engine No. 383 with the mica covering 11 hours 32 minutes were required for 138 lbs. of steam to disappear. Special attention should be given to the fact that the greatest difference in the loss of heat was at the high pressures. That is for the first half hour the wood lagging lost 24 lbs. while the mica lost only 14 lbs. and as the engines are usually worked at these pressures the greatest value of the lagging is at high points. A comparative test has also been made by the Canadian Pacific Railway between a number of different laggings in which a tank 14 in. high and 13⅝ in. in diameter was used and the result showed that the mica covering was much superior to any others.

AUTOMATIC LUBRICATORS FOR LOCOMOTIVES.

The subject of automatic lubricators for locomotives is attracting considerable attention at this time because of the difficulties which many are experiencing from imperfect lubrication of cylinders and slide valves. Among the reports of tests made to determine upon methods of improving practice in this respect, is one given in a paper by Mr. Parker, of the St. Paul & Duluth Railroad, recently read before the Northwest Railway Club. The paper is reproduced in abstract as follows:

The locomotive lubricator has been almost universally adopted as a means to lubricate the working parts of a locomotive that come in direct contact with steam. Still there has been a great deal of questioning and controversy about the real merit of the lubricator. As a receptacle to hold oil with water and steam behind it and permitting oil to flow from an oil well in a continuous stream, or in drops at any rate per minute, according to the wish of the operator; also delivering oil to oil pipe at connection to lubricator, we can say, that in all this the lubricator is a complete success, and in addition would mention the important fact that the lubricator enables the operator to economize in the consumption of oil. This no doubt is due to the fact that the flow of oil can be seen by means of the sight glass and the flow controlled by the regulating valve.

It is very encouraging and pleasing to look at a lubricator while an engine is working steam, or running with steam shut off, and observe the regularity of the feed of oil as it passes through the water that fills the sight glasses. If we could be assured that the oil was being delivered to the parts desired to be reached with the same regularity and in the same condition, all doubts as to the real worth of a lubricator would be removed. So the question is directly connected with the delivery and condition of oil. Is the delivery to the parts regular? Has the oil by being fed in drops and coming in contact with steam, at a temperature of 350 deg., lost any of its vitality?

In order to enable us to speak with some degree of intelligence about the question of regular delivery, we concluded to take some observations, not at the lubricator, but directly over the steam chest. This was accomplished by placing a bracket at that point to hold a sight glass, giving a view of 4¼ inches—all matter passing from lubricator to steam chest passing through the sight glass. From a position on the running board I was enabled to see what was taking place in the glass, and I have traveled over 1,000 miles watching the glass. We had a bracket with a glass on three engines, all equipped with Nathan No. 9 triple sight-feed locomotive lubricators, under various conditions, while on their regular trips between St. Paul and Duluth in passenger service. The work done by the engines at times was heavy on account of grade, and the speed was usually high, reaching at times one mile per minute. Four return trips were made between points already mentioned.

I will take up each trip in order, giving the conditions of each, and what was observed. The first trip was on engine 68, 17x24 in. It has a Richardson balance slide valve, 62 in. drivers, steam pressure 145 lbs., ½ in. copper pipe from the steam chest to condensation chamber on lubricator. The first two feet of the oil pipe from the lubricator was also ½ in. copper pipe. Oil was fed at the rate of five drops per minute with steam throttle wide open and 6½ drops when closed.

While the engine was standing and steam being admitted to the lubricator, there was a constant flow of water down the sides of the glass at the steam chest. After opening the feed valve of the lubricator and giving oil sufficient time to reach the glass, it could be seen flowing down the glass in one streak, retaining its original color and separated from the water that accompanied it.

When the throttle was opened and steam admitted to the steam chest, the water and oil in the glass were arrested in their downward course and moved upwards. As the slide valve covered and uncovered the steam port opening, this upward and downward movement in the glass continued, keeping time with the sound of exhaust. The agitation caused the oil and water to combine and form a milky liquid, and at times it was denser than others. The density increased as travel of slide valve was shortened. The longer these conditions were maintained the less the agitation became, and the density of the liquid in the glass became greater. The liquid near the top of the glass would come to a condition of rest and partake of a yellowish hue. There was a slight agitation at the bottom of the glass, and occasionally the matter at this point would go downward and was immediately replaced by clear water, which would become milky and drop again. This condition of things continued as long as the throttle and reverse lever remained undisturbed. When the throttle was closed the accumulation in the glass would drop immediately, followed by oil that seemed to have collected above the glass. Any time there was an accumulation in glass and the reverse lever was moved towards the center of the quadrant, this accumulation would also drop immediately and be replaced by clear water.

The second trip was made on the same engine with the lubricator unchanged, but instead of delivering oil at the steam chest we drilled and tapped an opening into the steam channel between steam chest and saddle. At this point we placed an oil plug with a bracket and sight glass. We inserted a pipe into end of plug that reached to the center of the steam channel; the end of the pipe was bent at right angles and in the same direction as the flow of steam. The results produced were about the same as on the previous trip—the only noticeable difference being less agitation in the glass, especially when speed was high. On the return trip we changed the steam pipe from steam box to condensation chamber from one-half inch copper pipe to five-eighth inch copper wire. We also connected the oil pipe to steam chest. The change showed a marked difference in favor of the lubricator. Under all conditions of throttle and reverse levers, the agitation in the glass was greater and the matter in the glass was reduced in volume and density. At regular intervals there was a continual change of matter taking place at bottom of glass. After the engine had run 20 or 30 miles at a high rate of speed and engine throttle was closed, the glass as usual was emptied immediately, but the amount of matter accumulated above the glass was small, comparatively speaking, with the previous trips.

The improvement observed at the glass is substantiated by the engineer in charge of engine, as he reports using less oil. Previous to the change in piping, the engine would show lack of lubrication. The difficulty has disappeared entirely.

When putting on oil pipes we see to it that there is a gradual decline from the connection at the lubricator to same at the oil plug on the steam chest. If there should be an incline to some extent in line of pipe it will form a pocket and matter passing down the pipe will lodge there, so that instead of the pipe being merely a channel for matter to flow through, it becomes to some extent a receptacle to hold it.

We concluded to take some observations from an engine having unbalanced slide valves. We selected engine No. 23, 17x24 in. equipped with Nathan No. 9 triple sight-feed lubricator, connected the same as the other engines, with the exception that the oil pipe was ⅝ inch copper pipe the entire length.

The action of matter in the glass on the last trip was a complete substantiation of all that was observed on the last trip on engine 68 and both trips on engine 69. The feed as seen at the glass was more frequent and the matter in the glass was much lighter in appearance, and there was absolutely no accummulation other than in the glass. Oil would appear, but only in sufficient quantity to coat the sides of the glass. This oil no doubt, instead of being allowed to pass slowly through the oil pipe, was drawn by a vacuum created in the steam chest, so that a larger supply of oil than usual reached the parts when steam was shut off. It was noticed after stopping at the depot and the engine started immediately, that the matter in the glass would remain clear for a longer time, showing that the oil pipe had been cleared of oil and had to be replaced before it could reach the glass.

There were some minor things observed, but they are not worthy of mention. We have given what we consider the most important; these observations have enabled us to reach conclusions that are very gratifying. They have settled many inquiries and removed many doubts as to the efficiency of locomotive lubricators as used at present, for the service and steam pressure that these tests were made under. This can be accomplished by proper regard for piping, insuring sufficient volume being delivered to supply all demands, thereby maintaining the boiler pressure at the lubricator, also eliminating all obstructions in the oil pipes.

NOTICES OF PUBLICATIONS.

The Maine Central believes in the liberal use of printer's ink in all colors. In addition to the regular publications in common to many roads the general passenger department has this year issued an extensive line of posters and hangers, some of which, particularly those in connection with its October excursions, are printed in colors vieing in gorgeousness with the mountain foliage which at this season of the year renders that section so beautiful and attractive. The reds, greens and yellows are used so effectively as to make one wish to visit the wooded hills of Maine at this season of the year.

The American Hoist & Derrick Co. of St. Paul, Minn., has issued a very handsome catalog of yard and platform loading derricks in which illustrations are given of derricks which have been built by that company for the L. S. & M. S. Ry., the Pennsylvania R. R. Co., the Missouri Pacific Ry. Co. and several others. This company is building a general line of derricks operated by steam, air, horse, hand, electric and belt power.

A descriptive and illustrated catalog of woodworking machinery entitled "Wood Workers Variety and Universal" has been received from Messrs. J. A. Fay & Co. of Cincinnati, O. This is a pamphlet of 32 pages 8x10¾ in. in size, not standard size. It is illustrated with perspective views of a large number of woodworking machines. Its illustrations and descriptions show the almost unlimited uses to which these special machines may be put, among the more important of which may be mentioned surfacing, planing out of wind, tapering, rabbeting, joining, beveling, chamfering, gaining, plowing, ripping, cross-cutting, tenoning, squaring raising panels, and manufacturing straight, circular or waved molding. The catalog will be sent to those who make application for it.

The Ranken & Fritsch Foundry & Machine Co., of St. Louis, has issued a catalog descriptive of the engines manufactured by that company. The catalog contains some very fine half tone engravings of plants which has been erected and also of details of the most important features of the engines. One of the plants illustrated is that of the West Chicago lighting station in which the company has two 20 x 40 x 28 in. high speed positive Corliss valve engines. The engines are upright and are belted to dynamos. Another illustration shows a 36 x 60 in. Corliss engine connected direct to a 800 K. W. generator at power house of the South Electric Railway Co., of St. Louis. Another fine half tone engraving shows a 22 x 40 x 48 in. heavy duty Corliss engine coupled direct to a Westinghouse generator in the plant of the Atlanta Consolidated Electric Co., of St. Louis. This engine runs at a speed of 94 revolutions giving a piston speed of 784 ft. per minute. The fly wheel is 18 ft. in diameter, weighs 110,000 lbs. and the weight of the engine alone is 315,000 lbs. The engine is of the horizontal tandem type and is a decidedly heavy job. The company has a pair of 34 x 72 in. heavy duty Corliss engines at the works of the National Tin Plate Co., of Anderson, Ind. Illustration are given of some of the heavy bed plates used by the company which are presented in very good style. The cylinders, crank, connecting rod, cross-head and valve gearing are all fully illustrated and described. Typographically the catalog is a good piece of work and the illustrations are all of a high class and fully bring out the points they are intended to emphasize.

All important stations on the New York Central are now supplied with invalid chairs for the transfer of passengers between trains and conveyances. A sick person traveling on one of its trains and wishing to be transferred to a carriage on the arrival of the train at the destination has only to inform the conductor, and he telegraphs ahead what is wanted and an attendant is at the station with the chair.

TECHNICAL MEETINGS.

The annual convention of the American Society of Mechanical Engineers will be held at the house of the society, 12 West Thirty-first street, New York City, December 1st to 4th, 1896. Secretary, F. R. Hutton.

The Engineers' Club of Cincinnati has a monthly meeting on the third Thursday in each month, at 7:30 p. m. at he Literary Club, 24 West Fourth street, Cincinnati, O. Address P. O. Box 333.

The Engineers' Club of Minneapolis holds its meetings on the first Thursday in each month, at Public Library building, Minneapolis, Minn.

The Engineers' Club of Philadelphia meets on the first and third Saturdays in each month, at 8 p. m., at the house of the club, 1122 Girard street, Philadelphia, Pa.

The Civil Engineers' Club of Cleveland, meets on the second and fourth Tuesdays in each month, at 8 p. m., at the Case Library building, Cleveland, Ohio.

The Association of Engineers of Virginia, holds its in formal meetings on the third Wednesday of each month from September to May inclusive, at 8 p. m., at 710 Terry building, Roanoke, Va.

The Western Railway Club of Chicago, holds its meeting on the third Tuesday of each month.

The Central Railway Club meets on the second Friday of January, March, May, September and October, at 2 p. m., at the Hotel Iroquois, Buffalo, N. Y.

The Denver Society of Civil Engineers meets on the sec ond and fourth Tuesdays in each month except July, August and December, when they are held on the second Tuesday only, at 36 Jacobson building, Denver, Colo.

The Western Society of Engineers holds its regular meetings for the transaction of business and the reading and discussion of papers on the first Wednesday of each month except January.

The American Society of Civil Engineers holds meetings on the first and third Wednesdays in each month, at 8 p.m., at the House of the Society, 127 East Twenty-third street New York City.

The Association of Civil Engineers of Cornell University meets weekly every Friday, from October to May inclusive, at 2:30 p. m., at Lincoln Hall, New York.

The Boston Society of Civil Engineers, meets monthly on the third Wednesday in each month, at 7:30 p. m., at Wesleyan Hall, 36 Bromfield street, Boston, Mass.

The Canadian Society of Civil Engineers meets every other Thursday at 8 p. m., at 112 Mansfield street, Montreal, P. Q.

The Foundrymen's Association meets monthly on the first Wednesday of each month, at the Manufacturers' Club, Philadelphia, Pa.

The Montana Society of Civil Engineers meets monthly on the third Saturday in each mouth, at 7:30 p. m., at Helena, Mont.

The New England Railroad Club meets on the second Tuesday of each month, at Wesleyan Hall, Bromfield street, Boston, Mass.

The New York Railroad Club has a monthly meeting on the third Thursday in each month, at 8 p. m., at 12 West hirty-first street, New York City.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m., at the St. Paul Union Station, St. Paul, Minn.

North-West Railway Club meets alternately at the West Hotel, Minneapolis, and the Ryan House, St. Paul, on the second Tuesday of each month.

The Engineering Association of the South meets on the second Thursday of each month at 8 p. m., at the Cumber and Publishing House, Nashville, Tenn.

The Railway Signaling Club holds its meetings in Chi cago, Ill., on the second Tuesday of January, March, May, September and November. G. M. Basford, secretary, 818 The Rookery.

The Southern & Southwestern Railway Club holds its meetings on the third Thursday of January, April, August and November, at the Kimball House, Atlanta, Ga.

The Western Foundrymen's Association holds its meet ngs on the third Wednesday in each month, at the Great Northern Hotel, Chicago, Ill.; secretary, A. Sorge, Jr., 1533 Marquette building.

PERSONAL.

Mr. Joseph D. McDonald, a well known railroad contractor of Fremont, Nebraska, committed suicide Thursday.

Mr. Guy S. McCabe will succeed Mr. A. S. Matchette as traveling freight agent of the Panhandle's Richmond & Chicago division.

Mr. W. G. Neimeyer has been appointed Chicago agent for the Pacific Mail Steamship Company and the Occidental & Oriental Steamship Company.

Mr. R. A. Denmark, of Savannah was on October 30 elected president of the Southwestern Railway of Georgia, to succeed President Baxter, deceased.

Mr. John Hamilton Inman, the well known capitalist who was largely interested in southern railroads, died at New York, Thursday, suddenly of heart disease.

An official announcement has been issued by the Flint & Pere Marquette raising Mr. Percy F. Gaines' title from commercial agent to general agent. His headquarters will remain at Toledo.

Mr. John M. Cutly, for years attached to the official staff of eastern railroads, has been appointed general freight agent of the Georgia, Southern & Florida road, with headquarters in Pensacola.

Mr. R. G. Matthews, formerly train dispatcher on the Hocking Valley road, then trainmaster on the Chicago & Eastern Illinois, has accepted a lucrative position with the American Signal Company.

Mr. C. C. Henion, traveling passenger agent of the Southern Pacific, has tendered his resignation and will return to California. Mr. Henion is well known among passenger men in this part of the country.

Mr. H. C. Shields has been appointed traveling passenger agent of the Wabash Lines, to succeed Mr. James Garvey, who died at Moberly, Mo., last week. Mr. Shields has been in the general offices for some years.

Mr. J. H. McBride on November 2 became special solicitor of the Western Passenger Association for prosecution of complaints against passenger and ticket agents. It is hoped by this means to check the dealing with scalpers.

Mr. D. I. Roberts, general passenger agent of the Erie lines, as soon as able to travel, will take an extended trip. He will not assume his official duties, it is stated, for some months. Mr. A. D. W. Cook, assistant general passenger agent, is in charge of the department during Mr. Robert's absence.

Mr. J. H. Somerville, assistant general roadmaster of the West Shore, was, on Monday, near Little Falls, struck by a passenger train and killed. Mr. Somerville has been on the West Shore road but a few years, going to that road from one of the Pennsylvania lines. He was a civil engineer of considerable ability.

Mr. George C. Sperry was on November 1 appointed superintendent of telegraph of the Mexican Central Railway, with headquarters at the City of Mexico. Mr. Sperry will have direct charge of all matters pertaining to that department except revenue which will remain with the traffic department, as heretofore.

As predicted at the time of Mr. Atterbury's promotion, Mr. Bernard Fitzpatrick will succeed him as master mechanic of the Pennsylvania Company's shops at Ft. Wayne and Mr. Thomas F. Butler succeeds Mr. Fitzpatrick at Columbus. Both of the officials received their mechanical education in the shops at Ft. Wayne.

Mr. George Forrest, formerly soliciting agent of the Flint & Pere Marquette at Detroit, Mich., under Commercial Agent Henderson, has been promoted to a traveling freight agency with headquarters at Toledo, and his former position will be supplied by Mr. L. G. Kummero, formerly of the main office at Saginaw.

Mr. Allan J. Smith, chief clerk to Superintendent J. H. Sullivan, of the Kansas City, Memphis & Birmingham, has been promoted to the position of trainmaster, to fill the vacancy caused by the death of Mr. Pinkerton, noted last week. The office of master of transportation, which was also held by Mr. Pinkerton, has been abolished.

Mr. C. W. Kouns has been appointed superintendent of car service of the Atchison, Topeka & Santa Fe system, including the Gulf, Colorado & Santa Fe and Southern California lines. He will have general supervision and control of the movement and distribution of cars, not only on the system, but as between these roads and others.

Lieut. Col. Henry C. Stanley, chief engineer of the railways of Queensland, is in New York, and will make a trip over some of the important railway systems of this country. In commenting on the locomotives of this country Mr. Stanley said the American locomotive was superior to those built in any country and best adapted to their lines.

The announcement has been made that Mr. W. W. Crane of the Illinois Central tropical fruit department has been promoted to the position of traveling freight agent of the same road, vice Mr. W. L. Lowry, who has had his headquarters at Jackson, Tenn. This appointment becomes effective on the 1st of the month. Mr. Crane will be succeeded in the tropical fruit department of the general freight office by Mr. Percy D. Parks at present assistant to Mr. Wm. M. Rhett assistant general freight agent of the company.

Mr. Norton R. Bagley, chief clerk of the general passenger department of the Northern Pacific, has handed in his resignation, to take effect Nov. 1, on account of unsatisfactory health. Mr. Bagley has been with the Northern Pacific general passenger department the last fourteen years, but will engage in business on his own account this winter in Augusta, Ga. His successor has not been officially named, but Mr. A. N. Cleland, the voucher clerk of the general passenger department will probably secure the position.

Several important changes are announced in the agencies of the Star Union Fast Freight Line, operating over the Pennsylvania system, to take effect at once: Mr. A. S. Matchette is appointed soliciting agent at Cincinnati in place of Mr. C. H. Schatzman, resigned, effective Nov. 2. Mr. H. C. Golden is appointed agent at Kansas City in place of Mr. S. D. Thatcher, assigned to other duties. Mr. Chas. H. Little is appointed agent at Davenport, Ia., in place of Mr. Golden, transferred. Mr. Chester E. Clapp is appointed agent at Quincy, Ill., in place of Mr. C. H. Little, transferred. Henry C. Shepard is appointed agent at St. Paul, Minn., in place of Mr. S. B. Gault, assigned to other duties. Mr. E. A. Bliss is appointed traveling agent under the direction of the agent at St. Paul. Mr. E. O. While is appointed traveling agent at St. Paul. These appointments take effect November 2. The agency at Winona, Minn., was discontinued Oct. 31, and the business of the Winona district will hereafter be in charge of the St. Paul agency.

RAILWAY NEWS.

Atlanta, Knoxville & Northern.—On Oct. 31, the purchasers of the Marietta & North Georgia paid over another $100,000 and at midnight took possession of the property. The new company which has been formed under the name of Atlanta, Knoxville & Northern has Mr. Henry K. McHarg, of New York, for president, and Mr. Eugene C. Spaulding, of Atlanta, for vice president.

Flint & Pere Marquette.—It is announced that the extension to the Flint & Pere Marquette road from Monroe, Mich., to Toledo, O., will be completed and ready for business Nov. 15, and coupon reresentations has been solicted of local lines.

Ft. Worth & Denver City.—A motion has been filed by the Ft. Worth & Denver City road to abolish the receivership of that road. Judge Green of the fourth district court of Texas made an order for the receiver to pay over $200,000 to the railway company to enable it to fully comply with its agreement, and as soon as the auditing of the accounts can be completed the receivership will be finally terminated.

Illinois Central—The new docks of the Illinois Central at New Orleans, called the Stuyvesant docks, in honor of the president of the road, were formally opened on Oct. 28, attended with pleasant ceremonies. The docks extend for 2,000 ft. along the river front and include 30 acres of ground, with cotton presses, wharves, grain elevators and warehouses all erected by the railroad during the past year, with the purpose of making New Orleans a free port, where there would be no wharfage charges or port dues to pay. In his speech at the opening President Fish said that the interests of New Orleans and the Illinois Central were identical, and that he would do everything in his power to develop the commerce of the city. The aim of the railroad was to make New Orleans an absolutely free port. It proposed also to develop its import trade so that the Mississippi Valley would import all it needed through New Orleans, the railroad being willing to contribute materially and financially to bring this about. A dinner was given at the St. Charles hotel in the evening in honor of the new docks.

Kansas City, Watkins & Gulf.—Right of way for the completion of this road into Sabine Pass has all been secured. The Kansas City, Watkins & Gulf is strictly a southern enterprise, and is a road likely to add to the railroad interests of New Orleans, as its business will be handled largely through New Orleans connecting lines. The road as now operated runs from Lake Charles to Alexandria, La., a distance of about 98½ miles.

Maine Central.—The Maine Central has this summer been double tracking its line between Old Town and Bangor. This has been completed to Webster, as far as it will be taken this season, the past week. The first train ran over it Monday morning. It is expected that another summer will see this double track system continued into Bangor.

Mississippi & La Fourche—The first section of the Mississippe & La Fourche Railway, comprising five miles of track extending from LaPice station on the Texas & Pacific R., in St. James parish, to the Belle Alliance plantation belonging to Messrs. E. & J. Kock, in Assumption, has been completed, and the carrying of freight over the new line has begun, which is expected to do a regular business henceforth that will reach considerable proportions during the sugar-making season just opened. An exchange in speaking of the opening of this new road, says: "First and foremost among those deserving credit for the inauguration of this important enterprise is Mr. R. W. Edwards, president of the Mississippi & La Fourche R. who has clung to the project in the face of difficulties and discouragements that would have disheartened nine men out of ten long ago. His courage and pertinacity have overcome all obstacles, and it is to be hoped the success so far attained will be but a precursor of the greater achievement to follow in the early extension of the road successively to Klotzville, Napoleonville & La Fourche Crossing."

New Haven & Derby.—The preliminary order in the case of the New Haven & Derby R. Co., against the Mercantile Trust Co., of New York City, has been signed by Judge Shumway of the superior court. It is alleged that New York City holds as trustee 216 shares of the Shepaug, Litchfield & Northern Railroad Co., and the plaintiff corporation asks for a receivership of the partnership known as the "Shepaug Syndicate," which some years ago acquired a large majority of the shares of the present Shepaug, Litchfield & Northern Co., and deposited them in trust with the Mercantile Trust Co. The syndicate lost control through the Sistare failure, and parties then controling the Housatonic system obtained virtual possession of the Shepaug, which since then, with the Housatonic system has passed into the control of the New York, New Haven & Hartford Railroad Co. The present suit is, in effect, a suit of the New Haven Co., to obtain possession of the remaining shares of the Shepaug, which is not now owned by it, and thus be in a position to merge the Shepaug line with its system. The New Haven & Derby road is a little more than 16 miles in length running between New Haven & Ansonia with a branch line from Derby to Huntington.

New Orleans & Southern.—The New Orleans Picayune says: "The Shell Beach R. passes from the hands of the New Orleans & Western, and it is said that a Mr. Campbell of Europe, has bought the stock. Mr. Campbell is not recorded as saying that there will be many improvements made in the road. He represents the original stockholders of the road, and the stock was bought in by him to protect the stockholders. What they will do with the property is unknown." This road is 15½ miles in length, running from Poydras to Shell Beach, La., and was originally the New Orleans & Gulf R., whose property was sold under the hammer in March, 1891. It is a branch of the New Orleans & Southern which is a leased line of the New Orleans & Western.

North Carolina R.—A question as to the legality of the lease of the North Carolina R. by the Southern has arisen, and provision will be made made for application to the legislature to bring the matter before the courts for investigation, the notice for the application having been given by the Farmers' Alliance. The directors, representing

the interest of the state and the private stockholders, last fall renewed the lease of the property to the Southern for 99 years at an increased rental, which amounts for the next five years to 6½ per cent on the capital of $4,000,000, and for the succeeding 94 years to 7 per cent, terms considered by business men as very advantageous to the state, but which were opposed by the populists and the Farmers' Alliance. The North Carolina R. is the Southern's principal division in this sectiou. It is said to be the opinion of First Vice President Andrus that the lease is valid in every particular, and he does not think it can be annuled, however great the pressure.

Northern Pacific—Lake Superior & Mississippi.—The secretary of the interior has declined to approve the designation of Duluth, Minn., as the eastern terminus of the Northern Pacific land grant, as the department holds that the terminal should be at right angles to the last section of the road and directs that a new terminal be established as the new eastern terminus of the road accordingly. Under the construction of the department, the line of both the Northern Pacific and Lake Superior & Mississippi Rs. are the same between Thomson and Duluth. A line of the same character as a terminal line should be established upon the Lake Superior & Mississippi R. at Thomson. Between the lines thus established and the eastern terminus of the Northern Pacific grant, when established as now desired, the Northern Pacific Co. will not be entitled to indemnity for lands to which the other company may have been entitled under its grant. The intention of congress, it is stated, was evidently to provide against making a double grant where two land grants were found to be upon the general line.

Ogdensburg & Lake Champlain.—A notification has been made to the bondholders of the Ogdensburg & Lake Champlain R. by Mr. Charles Parsons, chairman of the committee, that more than two-thirds of the bonds have been deposited with the Central Trust Co. of New York and the Old Colony Trust Co. of Boston, and that further deposits will be received until November 18, after which date there is no expectation of an extension of time, or, if otherwise, a penalty will be imposed.

Roanoke & Southern.—The announcement has been made by the special masters appointed by the United States court, that the Roanoke & Southern road extending from Winston, N. C., to Roanoke, Va., a distance of 102 miles, and which for several years has been operated under lease by and as a part of the Norfolk & Western system, will be sold under foreclosure proceedings November 24. No bid for less than $500,000 will be accepted under instructions of the court ordering the sale. It is understood that the new owners of the Norfolk & Western property will become the purchasers of the Roanoke & Southern and will operate the latter as heretofore. The Roanoke & Southern was built less than nine years ago by Winston and Roanoke capitalists, and is in good condition.

NEW ROADS AND PROJECTS.

Florida.—The Florida Western, which is to be built between Carrabelle and Apalachicola, a distance of 110 miles, has been placed under the management of Mr. R. L. Bennet of Tallahassee, and the work of construction has actually begun. Mr. Bennet has about 150 hands at work on the road, and will put on as many more. Apalachicola has needed a railroad for many years, and the citizens of that city are rejoiced to learn that one will reach there in a few months. The Florida Western will connect with the Carrabelle, Tallahassee & Georgia at Carrabelle.

Maine.—The rails on the new road being built from Canton to Peterson's Rips, Me., are nearly all down and the work is steadily nearing completion. The section of the road from Peterson's Rips to Jay Bridge is being pushed with all speed by the contractors, McGregor Bros., whose time limit for having it in operation is the first of February next, and who have a force at work in every cut, with good prospects for having the preliminary work well done before cold weather arrives.

New Brunswick.—Work on the construction of the Woodstock & Centreville road is progressing satisfactorily. The sub-contractors now at work, Hugh McIntyre and Smith are making progress on their respective sections in Centreville and Jacksonville. Mr. McIntyre is working both ways, going north and also going south, this side of the third tier Jacksonville road. This week Mr. C. W. Atmore started in. He began near the Connors road nine miles out of Woodstock and will work down towards the Connolly road towards McIntyre's section. The weather is very favorable for quick work.

New York.—The Perry, Livingston & Wyoming R. Co. has been incorporated in New York to construct a standard gage steam road about 12½ miles in length from a point on the Silver Lake R. in Perry, Wyoming county, to a point on the Delaware, Lackawanna & Western R. at Greigsville, Livingston county. The directors are Arthur C. Yates, Fred W. Yates, George E. Merchant, John F. Dinkey, George H. Clune, George L. Eaton, Robert W. Davis, of Rochester; Harry Yates of Buffalo, and William D. Page of Perry, N. Y. Capital stock, $125,000.

Pennsylvania.—The surveys have been made for a new trolley road between Wilkesbarre and Hazleton, Pa., which will be about 24 miles in length. This is a part of the scheme to build a road connecting the various electric systems from Carbondale to Hazelton, thereby making the largest system of electric roads in the country. The distance between the first named cities by steam roads is 49 miles, so that the trolley can readily compete with the existing roads for time, and at a much lower price.

INDUSTRIAL NOTES.

THE REVIVAL OF TRADE.

Telegraphic dispatches on Nov. 5 from all over the country indicate that the election of McKinley was all that was needed to revive business. A few specimens are as follows:

YOUNGSTOWN, O.—Blast furnaces, which have been idle for months, are being lighted, the furnaces of the Ohio Iron & Steel Co. making its first cast to-day, and the Andrews & Hitchcock Iron Co. will light its furnace to-morrow. Others are rushing repairs to start during the present month. Rolling mills, which have been running less than half time, are preparing to run double time.

President Henry Wick of the Ohio Steel Co said this evening (Nov. 5):

"We received a large order, conditional on the election of McKinley. A message last night said the contract was ours and to rush."

WHEELING, W. VA.—The Whittaker Iron Co. to-day started four sheet mills and one tin mill. The puddling and bar mills also resumed. The remainder of the plant will be put into operation at once. The Bellair steel works started this morning. The Belmont forge and nail works went on this morning. The Riverside Iron works will be on full time Monday. The La Belle plate mill went on to-day. The Riverside has arranged to start two furnaces. The Ætna Standard put on four departments to-day. These concerns employ 5,000 men.

DENVER, COLO.—J. T. Grayson, mining promotor, says: "I know of more than $20,000,000 that is looking for investment in this state, and if the right kind of properties are found, the money will be placed here in six months. The confidence which investors will have in the stability of the government under McKinley is a strong feature in placing investments. I am now looking for the greatest era of prosperity known in the state."

The laying of rails on the Golden Circle Railroad in the Cripple Creek mining district was begun to-day. Syl. T. Smith, president of the Florence & Cripple Creek Railroad, is in charge, and it is reported that he has floated bonds there for the construction of not ouly the Golden Circle, but also for the Florence Southern Railroad, which is to run from Florence to Silver Cliff district.

TONAWANDA, N. Y.—The Niagara Iron & Steel Works, a new enterprise at Tonawanda, N. Y., was opened Thursday with public ceremonies. President-elect McKinley pressed the button at Canton, O., which started the machinery.

LOUISVILLE, Ky.—The Ohio Falls Car Manufacturing Co. has a contract for 2,000 freight cars which was contingent upon the election of Mr. McKinley. As soon as he cast his vote President Smyser left for New York to bid for more. The car works employ 2,500 men. The Louisville & Nashville Railroad Co. has let a contract for 1,000 gondola cars.

CINCINNATI, O.—Freight Traffic Manager W. P. Walker, Jr., of the Chesapeake & Ohio, who came here from New York to vote, returned on the F. F. V. at noon Thursday. Before leaving he said: "If we have anything like the business we are now expecting we will not have ships enough and will have to build at least three of 10,000 tons burden. The Chesapeake & Ohio steamship line is having about all it can handle now."

The Big Four, Chesapeake & Ohio, and Baltimore & Ohio Railways all ordered their shops opened Thursday and enlarged forces at those already running. The Ensign car works at Huntington, W. Va, resumed. The car works at Mount Vernon, Illinois, has an order for 300 cars from the Louisville & Nashville road and resumed work to-day. The Niles tool works and other shops at Hamilton announced increased forces. Furnaces at Ironton, Ashland and other river towns announce that they will go in blast soon, but no dates are given. The Griffith wood works and the Powell brass works, both large concerns employing many men, announced to-day that they would resume at once. Others report that they had conditional orders on which they will enlarge their forces immediately.

The Pittsburg Packet Company closed a contract here to-day for building a new $65,000 river steamboat. The plans were made and the contract was drawn up two months ago. The closing of it was conditioned upon the result of this election.

One, and probably two of the idle mills of the Addyston Pipe Company, this county, will start in full as soon as repairs now in progress can be completed.

The Burgess iron works at Portsmouth, which has been working a short force, announces that it will employ a full force immediately.

CLEVELAND, O.—J. W. Britton, president of the Britton Rolling Mill Co., announced to-day that in two weeks he would open a new mill, giving employment to 200 men.

J. H. Van Dorn of the Van Dorn Iron Co., says his concern will go ahead on several contracts at once and will begin work on extending their plant.

BIRMINGHAM, ALA.—The Birmingham Rolling Mill, with 1,500 employes, resumed operations last night, and the Gate City Rolling Mill, with 1,000 employes, will resume next Monday. The Howard Harrison Iron Works at Bessemer, the largest iron pipe factory in the south, is preparing to put its full quota of 1,500 men to work and plans for the establishment of new industries, delayed by the silver agitation, are again under construction.

CHILLICOTHE, MO.—President Bacon of the Baltimore & Ohio Southwestern Railway has instructed the master mechanic to increase the working time at the shops of the company at Chillicothe to nine hours and to increase the force at the shops as much as possible, so that the rolling stock of the road can be put in shape and all manufacturing industries of the city are making preparations for increased business.

KANSAS CITY, MO.—"We will put 1,500 more men on the construction of the Kansas City, Pittsburg & Gulf Railway at once," said President A. E. Stillwell of that road to-day. "We began laying tracks south of Mena, Ark., yesterday at the rate of three-fourths of a mile a day. We have secured cablegrams from Europe buying our securities this morning.

FORT WAYNE, IND.—The superintendent of the Fort Wayne division at the Pennsylvania Railroad said to-day:

"I look for an increase of men in the shops and on this division. New engines will have to be built and all the cars we can secure must be brought into requisition.

"Our equipment in engines must be increased at least 25 per cent to meet the demand that is already becoming apparent."

BALTIMORE, MD.—The South Baltimore Car Works having emerged from the receivership, opened up on full time Wednesday and Thursday.

PITTSBURGH, PA.—A meeting of the Bar Iron Manufacturers' Association has been called for to-morrow, and a meeting of the steel billet pool will be held next Tuesday. The object of both gatherings is to consider the changed condition of trade since the election. The prices on iron and steel products began to advance to-day. Pig iron was selling at the furnaces in the Mahoning and Shenango Valleys at $12.25, which means that the price in Pittsburgh is from $12.60 to $13.90. Some brokers report that larger sales have been made at the advanced figures. The owners of pig iron expect a better market, and want a profit on their product, which they have not had for some months.

In connection with the advance in the price of pig iron comes the rumor that four of the valley furnaces are to be blown in within the week. Two of the Carnegie furnaces, one of the Carrie furnaces at Braddock and the furnace of the Pittsburgh Iron & Steel Co. at Soho, which are idle, will be blown in.

The big plant of Howe, Brown & Co. resumed this morning. It employs over 800 men and had not been running full for several years.

The Hainsworth Steel Co. will put its plant in operation on Sunday night. It has been closed in all departments for several weeks.

The Oliver Iron & Steel Co. had many conditional orders and will put its wire mill on full next week.

The Monongahela Tin Plate Co. will also put its works in full operation, and the Black Diamond Steel Works is expected to go on in a few days.

The Pittsburgh Wire Co. is preparing to start its plant at Braddock, Monday. It has been closed for two months. Four hundred men now idle will be employed.

The Shoenberger Steel Co. has nearly completed three new open hearth furnaces, which will be started as soon as possible.

The glass works at Avonmore, Pa., which have been idle for a year, will begin blowing at once.

WEST SUPERIOR, WIS., Nov. 5.—Before election Captain Alex. McDougall, manager of the American Steel Barge Co., announced that in the event of republican success work would be resumed in the shipyards here. To-day the machinery was put in motion with several hundred men at work, and McDougall promises that the plant will continue in operation all winter and all next summer with 1,000 men employed.

The two whalebacks, Nos. 101 and 102, will be lengthened, and contracts for more construction are assured.

Cars and Locomotives.

—The Ensign Manufacturing Co. of Huntington, W. Va. received an order from the Chesapeake & Ohio Railroad Co. for 200 coal cars of 30 tons capacity, to be entered as an order Wednesday, Nov. 4, in case only of the election of McKinley.

—The Fox Solid Pressed Steel Co. at Joliet, Ill., will have its big plant in full operation again within ten days and 500 men will go to work.

—The Iron Mountain Railroad shops at Liitle Rock, Arkansas, which have been running five days a week on short force several months, have resumed full time with the regular force.

—The northwestern system of the Pennsylvania Lines West of Pittsburgh has ordered material for 200 box cars to be built at the Ft. Wayne shops.

—The Wisconsin Central Railroad will place orders at once for about 1,000 freight cars.

—The Toledo & Ohio Central road is now in the market for 500 to 1,000 box and coal cars.

—The Youngstown Car Manufacturing Co. of Youngstown, O., has been awarded a contract for the construction of 100 freight cars by the Georgia Railroad Co.

—The C., R. I. & P. Railway Co. is reported as about to submit plans and specifications for 500 box cars.

—The Rhode Island Locomotive Works of Providence, R. I., has received an order from the Mexican Central Railroad Co. for the building of ten 10-wheel engines.

—The Spokane Falls & Northern Railway Co. has placed an order with the Baldwin Locomotive Works of Philadelphia for the building one 6-wheel engine.

—The Cooke Locomotive & Machine Co. of Paterson, N. J., has just completed a new passenger engine for the Grand Trunk Railway to run on the Chicago section of the

system. The engine was designed by Mr. F. W. Morse, superintendent of motive power, and is for heavy, fast passenger service. The total weight of the locomotive when in working order is 120,437 lbs.

Bridges.

—The citizens of Eight Mile Grove precinct, Nebraska, are to vote on the question of building a bridge over the Platte River at Cedar Creek at an estimated cost of $8,000.

—The question of widening and altering the bridge over the New York & New England Railroad at Blackstone, Mass., is being considered by the selectmen and the railway officials.

—The construction of a bridge over the railway tracks in Americus, Ga., is being considered by the council and the Georgia & Alabama Railroad Co.

—At the meeting of the East River Bridge Commission, held in New York City, the contract for the building of the New York tower of the bridge was executed and signed by the several commissioners and the contractor P. H. Flynn. The contractor's bond, in sum of $400,000, has been signed, and the first work on the tower will be commenced shortly.

—The city engineer of Wausau, Wis., who was directed by the council to prepare plans for a steel and iron bridge submitted same October 5, but action on the same was postponed until November 5. The plans call for a 4 span bridge of 125 ft. each, and 100 ft. of iron trestle approach, a 14 ft. roadway and 6 ft. sidewalks. Iron cylinder piers 4 ft. in diameter and 5-16 in. metal are to be used for the foundation.

—J. K. Geddes, receiver Bellaire, Zanesville & Cincinnati Railway Co., states that contract has been let to the Toledo (O.) Bridge Co., for 500 lineal feet of plate girder bridges, to replace the 10 spans destroyed by the recent floods.

—Bids are asked until November 11 for constructing an iron bridge over the Des Moines River at Red Rock, Ia., bidders to furnish plans.

—It is reported that a new bridge is to be built in Watertown, N. Y., to take the place of the one which recently was partly destroyed.

—The two bridges to be built by the Butler & Pittsburgh Railway will soon be ready for estimates. The one over the Allegheny river will be 3,000 ft. long, and will stand 130 ft. above low water. The bridge over the Monongahela river will be built by the Union Railway Co.

—It is reported that the county commissioners are considering the question of building a new bridge over the Grand River, at Rodericks Ferry, Col.

Buildings.

—The Texas Central Railroad Company has completed a neat and commodious passenger depot at Hico, Hamilton county, Texas, in lieu of the one burned some time since.

—The McGuire Manufacturing Co , Sangamon and Kinzie streets, Chicago, is arranging plans for a very large addition to its plant for the manufacture of car trucks and freight car doors. There will be erected a building 116x164 feet, six stories high, with outer walls of brick, stone and iron. and interior of mill construction. It will be provided with electric light, electric elevators and electric power for the operation of machinery. The company has made substantial gains in its business in recent years, despite the prevailing depression.

—Contract has been let to A.O. Bennett for the erection of a passenger depot at Barnesville, Ga.

—Receiver Frank Trumbull of the Union Pacific, Denver & Gulf Railroad. has had maps and plans prepared for new locomotive and car shops to be erected at Denver, Colo., at a cost of $500.000. The company owns a tract of 71 acres between the Fourteenth street viaduct, north and west to the Platt river, Third street and the railroad tracks, which will be settled up. Besides the machine shops, a large freight depot will be built.

—Ground having 110 feet frontage, on Second avenue, near the Tenth street bridge, has been secured by the Safety Car Heating & Lighting Co., 160 Broadway, New York City, on which a plant will be erected. The company supplies complete equipment for Pintsch gas and steam heating systems for railway cars, either by direct steam or hot water circulation.

—The Georgia Southern & Florida Railway will immediately build costly warehouses, office and shop buildings at Macon, Ga.

—Finishing touches are being made on the brick building just completed by the Galena Oil Co., at Franklin, Pa, The structure is 80x32 feet and is to be used as a cooper shop and filling department. It consists of two stories and a basement, and will contain several immense tanks for the storage of oil.

—Contract has been let to the F. L. Stevenson Contract Co. of Dallas, Texas, for the erection of a $7,500 eating house building at Temple for the Gulf, Colorado & Santa Fe Railroad.

—The Baltimore & Ohio Railroad Company has let contract to J. J. Walsh & Son of Baltimore, Md., for the erection of a station at Clarksburg, W. Va., to cost $18,000.

—The Georgia & Alabama Railway, Cecil Gabbett, general manager, will build a depot at Americus, Ga.

—The Southern Railway will build a $3,500 depot at Rock Hill, S. C.

—The briquetting plant of the Texas Briquette & Coal Co., at Rockdale, Texas, was destroyed by fire on the night of the 3d instant. The plant is to be rebuilt at once in a very substantial manner. The plant will have a capacity of 300 tons of briquettes in ten hours. The buildings will be iron and brick, and the whole plant will be fire proof throughout. Stein & Boerick, Limited, Philadelphia, Pa., are the engineers in charge of the work.

—The Santa Fe Railroad Company is making some improvements at its shops at La Junta, Colo. The frame boiler house at the machine shops is to be torn down and replaced by a brick building and considerably enlarged. Two large cisterns are to be built to head the water from the artesian wells. They will be 15 feet deep, one 30 feet in diameter and the other 40 feet.

—The new club house of the Westinghouse Air Brake Co., at Wilmerding, Pa., which was burned last summer, has been rebuilt on a larger scale than before. It is equipped with a gymnasium and reading room for the benefit of the employes of the Westinghouse Air Brake Co.

Iron and Steel.

—The structural department of the Maryland Steel Co., of Sparrow's Point, Md., reports the following: "We have the contract for a large bridge at New Bedford, Mass., the approximate weight of which it is expected will reach about 1,500 tons. We have completed a 123 ft. railroad span for the Baltimore & Lehigh Railroad Co. We have also just completed two plate girder spans for the Southern Railway Co., and have another span 128 ft. in length to erect. We are now just completing the steel work for the Medico-Chirurgical hospital at Philadelphia, for the Newark Technical School at Newark, N. J., and for a large manufacturing plant for the Slaymaker-Barry Co. at Connellsville, Pa. We are furnishing the columns and girders for the Gillender Building, and columns for the New York Life Building and Appraiser's Stores of New York City. We have nearly completed the steel work for the train shed for Mount Royal Station for the Baltimore & Ohio Railroad Co. at Baltimore. We also have now in hand the structural steel work for the Pioneer Storage Building, Brooklyn, and the Gate of Heaven Church, Boston."

—The Cleveland Steel Co., Cleveland, O., has commenced work on the erection of an open hearth plant, and will soon be able to furnish slabs for its sheet and plate mills. The main building will be of iron construction, with 70-ft. span and 250 ft. in length. Two 15 ton furnaces will be built at present for the manufacture of high grade acid open hearth steel. It is the intention to cast small ingots or slabs, and the necessity of blooming down will be obviated. Under patents taken out by John A. Potter, superintendent, it is expected that these slabs, which will be 3x24x24 in. will be cast in the absence of air and a uniform fibrous steel secured, avoiding piping, segregation and other defects which it is difficult to combat under present practice. It is probable that the company will in the future commence the manufacture of crucible steel. This concern recently commenced rolling copper sheets and plates, and initial orders have been taken for 50,000 to 60,000 lbs. of material. It expects to supply the trade, or at least a portion of it, which has heretofore been supplied by concerns in Pittsburgh and Detroit. The company states that it is prepared to furnish plates and sheets in copper from 1 in. down to 20 gage.

—The Carnegie Steel Co. is furnishing the iron and steel for the new Park row building being erected in New York City. The building is planned for 30 stories, and will be the tallest office building in the world when completed. The contract will amount alone to $500,000, and the cost of construction on the entire structure will be close on to $2,000,000.

—Every thing is in readiness to blow in Soho furnace of the Union Trust Co., receivers for the Pittsburgh Steel & Iron Manufacturing Co. at Pittsburgh. The furnace has been extensively overhauled and rebuilt, and is said said to be in first-class condition. It will not, however, be started until there is material improvement in the iron trade. It is believed the furnace will be capable of turning out about 250 tons of iron per day when in operation.

—The Whitely Malleable Castings Works at Muncie, Ind., has resumed full force, after being partially idle for over four weeks, during which time only a few pattern makers. and a small number of other employes were at work.

—Dispatches from Iron Mountain, Mich., state that the find of Bessemer ore in the old channel of the Michigamme river, at the Mansfield mine promises to be the richest and most extensive that has been discovered in the upper peninsula in recent years. Investigation proves that the deposit is 1,000 ft. in length and is supposed to have a great width and depth. As soon as the lower dam is completed, which will prevent the water in the new channel of the river from backing up into the old, the find will be test-pitted. In many places the ore is so soft that it is thought it can be mined with a steam shovel leading directly into the cars. The cost of changing the channel of the river has not exceeded $30,000, and the ore in sight is worth many times that sum. The ore shipping season is rapidly drawing to a close, only six mines now forwarding to the docks. The shipments from this range for the season will exceed 2,000,000, however. The amount of ore remaining in stock is the largest in the history of the range, reaching half a million tons, and the season cannot be considered a prosperous one, although the Menominee has suffered to a less extent than any in the Lake Superior region. The Chapin Co. has 100,000 tons of unsold ore in stock here and 200,000 tons at Ohio ports. Notwithstanding this immense surplus of unsold ore the mine will continue in operation throughout the winter with no reduction of force or wages now that Mr. McKinley's election is assured. What is true of the Chapin is also true of every mine in the district.

—The Shiffler Bridge Co., Pittsburgh, Pa., has received a contract for the iron work for the building to be erected by the Mariopol-Nicopol Mining & Metallurgical Co., of Mariopol, Russia. It will be remembered that this company has placed large contracts for buildings and machinery for a pipe and tube plant to be erected at the above place, the contract for the erection having been placed with Miller Bros. & Co., also of Pittsburgh. Julian Kennedy, of Pittsburgh, has been consulting engineer for the concern. The contract placed with the Shiffler Bridge Co., calls for the iron work for five buildings, as follows: Blacksmith shop 60 ft. wide by 100 ft. long, of brick and iron; machine shop, main span 45 ft. wide, two side sheds each 24 ft. 6 in., and the building will be 240 ft. long and equipped with an electric traveling crane; the foundry building will be 123 ft. wide and 166 ft. long, and will be all iron; the tube weld building will be 80 ft. wide and 250 ft. long, and will also be all iron; the open hearth building will be 90 ft. wide, 210 ft. long, with 40 ton electric traveling crane; the rolling mill building will be 180 ft. wide and 300 ft. long. All the above iron work will be prepared at the shops of the Shiffler Bridge Co., in Pittsburgh, and sent from there to its destination in Russia. The same concern has a contract for the erection of a blacksmith shop for the Boston & Montana Consolidated Copper & Silver Mining Co., at Great Falls, Mont. It also has a contract for the iron frame work building for the Pintsch Compressing Co., of Pittsburgh and a kiln house for the Pennsylvania Salt Mfg. Co., Natrona, Pa. An important contract recently secured by this concern is a brick and iron building 100 ft. wide and 900 ft. long, to contain the open hearth furnaces, soaking pits and rolling mills of the Buhl Steel Co., at Sharon, Pa.

Machinery and Tools.

—The Baltimore & Ohio is making further improvements to its power house near Camden Station, in Baltimore, from which electric power is generated for the freight motors used in the Belt Line tunnel. Additional steam boilers, representing 500 horse power, are being installed, while a 600 horse power Green & Corliss engine is also being erected. This will couple direct to a 500 kilowatt generator. Two 120 kilowatt machines now in use are to be replaced by two 150 kilowatt generators, giving the power station a greatly increased capacity. It is understood that arrangements are nearly completed for hauling all rolling stock through the tunnel by electricity and making a section of the road from Camden station to a point in the northern suburbs exclusively an electric line.

—An order which the Westinghouse Machine Co. recently received, through its Paris branch, for a 1,200 horse power engine, similar to those exhibited by that company at the world's fair, would seem to indicate that some features of the great exposition made substantial and lasting impressions on our foreign visitors. The engine is to be used in an electric lighting station in France.

—We were in error in stating in our issue of October 24 that the Lloyd-Booth Company, operating the Falcon Foundry & Machine Works at Youngstown, Ohio, had recently put in a Shaw electric crane furnished by the Industrial Works of Bay City, Mich. These cranes are manufactured by the Shaw Electric Crane Co. of Muskegon, Mich., of which Messrs. Manning, Maxwell & Moore, of New York City, are the largest stockholders and sole selling agents. This company is the original manufacturer of the three motor electric cranes.

Miscellaneous.

—The Falls Hollow Staybolt Co. of Cuyahoga Falls, Ohio, has been furnishing staybolts to the Southern Railway Company, and a sample recently tested at that company's laboratory at Washington, D. C., showed the following excellent results;

Elastic limit per square inch - - - - -	31,600 lbs
Ultimate strength per square inch - - -	51,000 lbs
Elongation in 8 inches - - - - -	31.25 per cent

These bolts are rolled from the best charcoal iron, the average length of bar being six feet, and they are guaranteed by the company to be equal if not superior to any of the imported brands in the market.

—The freight steamer City of Philadelphia, building by the Jackson & Sharp Company at Wilmington, Del., for the Commonwealth Transportation Co. of Philadelphia, was launched last Thursday afternoon. She will ply between Philadelphia and New York. Her dimensions are; Length, 150 ft.; breadth of beam, 26 ft.; depth of hold, 10 ft. Immediately after being launched she was towed to the shipyard of the Pusey & Jones Co., where she will receive two masts, after which she will proceed to Philadelphia where her machinery will be put in by the Neafie & Levy Company.

—Local papers state that plans have been completed by the New York & Brooklyn Railroad Co. for a traffic tunnel under the East River between Brooklyn and New York, which it is claimed can be completed within a year. The start is to be made as soon as the necessary franchises are secured in Brooklyn. The consent of New York has already been obtained. The Brooklyn terminal station will be located near Willoughby and Adams streets. The route will be in nearly a straight line from the Brooklyn terminal to the New York terminal at Park Row and Ann street. The tunnel will be wide enough for four tracks. It is estimated that a speed of 25 miles per hour can be maintained, thus rendering it possible to make the trip from terminal to terminal in less than two minutes. The entire distance will be less than 8,100 feet; estimated cost, $6,000,000.

—The Chattanooga Coupler & Supply Co. has been formed by George H. Pierce, M. T. Freeman, C. S. Wilkins and others to manufacture a car coupler, etc.